МИНОБРНАУКИ РОССИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ «НИЖЕГОРОДСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ ИМ. Р.Е. АЛЕКСЕЕВА» (НГТУ)

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Очная форма обучения

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Part 1

General English Tests

Целью предлагаемых тестов является проверка и корректировка знаний по курсу General English.

1. Прочитайте предложения. Выберете слово или слова из четырех предложенных вариантов к каждому предложению и запишите его на подготовленном вами листе ответов. Следуйте приведенным ниже примерам 1 и 2.

Example 1

I like Mary, because .... is very beautiful.
(A) he (B) it (C) **she** (D) they

(C) is the right answer.

Example 2

That milk has .... into sour.

(A) come (B) **turned** (C) got (D) become

(B) is the right answer.

Test 1

1. **Mrs. Brown is .... a little tired today**.

   (A) looking (B) being (C) appearing (D) seeming

2. **We are .... their reply to our letter.**

   (A) understanding (B) considering (C) liking (D) appreciating

3. **James Watt .... the steam engine.**
   (A) invented (B) invents (C) had invented (D) has invented

4. **We .... to the theatre yesterday.**
   (A) went (B) have gone (C) had gone (D) go

5. **Eileen's late: she .... delayed by the traffic.**
   (A) could be (B) can have been (C) had to be (D) may have been

6. Mr. Hawthorne spent the weekend in the country as he .... into the office on Saturday.

(A) needn't have (B) mustn't
(C) didn't have to go (D) wasn't necessary

7. If ...., we'll stay at home.

(A) it'll (B) it rains (C) it's to rain (D) it'll be raining

8. The bearing must be lubricated if friction .... cause overheating.

(A) will not (B) is not to (C) should not (D) does not

9. We reported the incident which was .... last night.

(A) observed (B) happened (C) occurred (D) taken place

10. The letter .... yesterday.

(A) arrived (B) posted (C) delivered (D) send

11. Dr. Jackson .... all his colleagues the new findings presented at the conference.

(A) repeated (B) reported (C) informed (D) promised

12. We were .... the theorem by the teacher.

(A) explained (B) proved (C) described (D) shown

13. I want .... me.

(A) your helping (B) that you help (C) you to help (D) you help

14. Poor Bill couldn't help ....

(A) coughing (B) to cough (C) that he coughed (D) cough

15. The information that the police .... now being analyzed.

(A) have obtained are (B) has obtained is
(C) have obtained is (D) has obtained are

16. Everyone .... a difficult subject.

(A) knew that economics is (B) know that economics are
(C) knows that economics are (D) knows that economics is

17. Biology is .... .

(A) science of life (B) science of the life
(C) the science of the life (D) the science of life

18. When we saw his face, we knew .... would be bad.

(A) the news (B) some news (C) a news (D) news

19. The bridge broke because it was .... to carry the load.

(A) too fragile (B) very fragile (C) fragile (D) so fragile

20. This question is .... easy.

21. Jim passed the examination despite .... .

(A) he did not understand some of the questions
(B) the hard work he had done on the course
(C) he had worked hard during the term
(D) his failure to answer one of the question

22. It had been observed that the traffic is at its heaviest between five and six o'clock. In consequence, ...

(A) most motorists are travelling home at that time
(B) the traffic is also very heavy between one and two o'clock
(C) many motorists prefer to drive home after six o'clock
(D) the traffic becomes much lighter after six o'clock

23. Stainless steal is resistant to corrosion and may ... be used where the risk of corrosion is high.

(A) similarly (B) correspondingly (C) namely (D) accordingly

24. My friends are ....laughing at me.

(A) usually (B) sometimes (C) always (D) never

25. Let's have a cup of tea, ...

(A) shall we (B) will we (C) let us (D) haven't we

26. It was good ....him to help us.

(A) by (B) from (C) of (D) about

27. - Could you give these books to Mr. Mackintosh?

- Certainly .... him about something else in any case, so it won't be any bother.

(A) I'll see (B) I see (C) I'll be seeing (D) I can see

28. As you ....to finish his dissertation.

(A) know, Frank is trying_ (B) are knowing, Frank tries
(C) know, Frank tries (D) are knowing Frank is trying

29. Sydney Cockerel .... the hovercraft.

(A) invents (B) had invented (C) invented (D) has invented

30. George .... hard since last week.

(A) is working (B) was working
(C) had been working (D) has been working

31. You ....read that article if you don't want to.

(A) haven't (B) needn't (C) can't (D) mustn't

32. Look what you've done. You ....be more careful.

(A) may (B) had to (C) would (D) should

(A) had missed (B) would have missed (C) would miss (D) missed

34. .... it reaches 100 C will the water boil.
(A) providing (B) condition (C) if (D) only_if

35. I am ....by his behavior.
(A) annoyed (B) enjoyed (C) resented (D) angered

36. The use of a small heater will .... in the course of experiment.
(A) rise the temperature if it falls
(B) rise the temperature if it lower
(C) rise the temperature if it lowers
(D) raise the temperature if it falls

37. Adam .... his plan.
(A) told (B) announced (C) advised (D) said

38. Tom wished .... .
(A) good luck (B) good luck to us (C) us good luck (D) good luck for us

39. I suggest .... again.
(A) us try (B) us trying (C) us to try (D) we_try

40. Smith and Brown are ....to be authorities on the subject.
(A) accepted (B) regarded (C) acknowledged_ (D) looked

41. Each of us .... just been broadcast by the BBC.
(A) was expecting the news which have
(B) was expecting the news which has
(C) were expecting the news which have
(D) were expecting the news which has

42. Not one in a thousand readers .... analyses of the problem.
(A) understands these (B) understand this
(C) understands this (D) understand these

43. Let me give you .... .
(A) advice (B) an advice (C) the advice (D) some_advice

44. Dr. Smith has written a book on the water .... .
(A) resources (B) power (C) technology (D) cycle

45. Mary was .... rude that everyone disliked her.
(A) so (B) too (C) very (D) such

46. Poor Bert is .... stupid.
(A) little (B) fairy (C) plenty (D) rather

(A) life is more expensive in the town than in the country
(B) the majority of people here would rather live in the country
(C) they can't have all the comforts of civilized life
(D) most of them have a small house by the sea or in the country

48. The government introduced stiffer penalties for driving under the influence of alcohol with a view to .... .
(A) the number of drivers who are found to have too much alcohol in their blood
(B) passing a new law which imposes a maximum fine of 500 pounds
(C) the increase in the number of serious road accidents in recent year
(D) reducing the number of accidents caused by drunken drivers

49. The tube is inserted into the flask.....the end rests on the surface of the liquid
(A) in a way that (B) in such a way that
(C) in the way that (D) in a way such that

50. If you .... John this morning, you could have helped him.
(A) saw (B) had seen (C) have seen (D) would have seen

51. Janet doesn't drive yet, but she wants ....
(A) a car of her own (B) an own car
(C) the car of her own (D) the own car

52. The Great Powers are watching .... suspiciously.
(A) one the other (B) the one the other
(C) one another (C) one other

53. Pauline is being ....
(A) unhappy (B) delighted (C) beautiful (D) helpful

54. The small children .... them.
(A) played in the field when I was noticing
(B) were playing in the field when I was noticing
(C) played in the field when I notice
(D) were playing in the field when I noticed

55. – Have you seen Star Wars?
- And .... it?
- No.
(A) do you enjoy (B) had you enjoy
(C) have you enjoy (D) did you enjoy

56. There have been many changes in my country .... last year.
(A) all (B) since (C) during (D) until

57. Albert ....an essay yesterday, so he couldn't come to the meeting.
(A) must write (B) must have written
(C) had to write (D) ought to write

58. I don't believe him: he ….be serious.
(A) needn't (B) mayn't (C) mustn't (D) can't

59. If I ….the answer I'd tell you.
(A) should know (B) know (C) would know (D) had know

60. …. you need some help, give me a ring.
(A) will (B) do (C) would (D) should

Оценки:

% правильных ответов	Количество правильных ответов	Оценка
40	0 - 24	Неудовлетворительно
60	25 - 36	Удовлетворительно
80	37 – 48	Хорошо
> 80	49 - 60	Отлично

Test 2

Выберите правильный вариант ответа

1. She hasn't written to me _____ we met last time.
   A. ago B. since
   C. before D. for
2. I was a bit worried because I thought I might _____ my train.
   A. lose B. miss
   C. be late D. not reach
3. I'm _____ in the news.
   A. exciting B. interest
   C. interested D. interesting
4. How can I _____ to the post office?
   A. arrive B. reach
   C. get D. find
5. I think John _____ translate this document.
   A. has B. will have to
   C. have to D. will have
6. He arrived _____ you were asleep.
   A. while B. during

7. This question is _____ difficult for me.

A. such B. too
C. enough D. to

8. It's a small town in the south _____ England.

A. - B. from
C. to D. of

9. I _____ breakfast when the phone rang.

A. had B. was having
C. am having D. have

10. Mr. Smith woke up in the middle of the night. He could hear _____ in his garden.

A. someone B. anybody
C. everywhere D. anything

11. "Must I take my umbrella?" "No, you _____. It's not going to rain."

A. mustn't B. have to
C. don't D. needn't

12. This car is more _____ than that one.

A. faster B. fastest
C. fast D. modern

13. This record-shop _____ be a book-shop a few years ago.

A. using to B. used
C. use D. used to

14. Couldn't you go a little faster? I'm _____ a hurry.

A. of B. in
C. at D. on

15. I usually wear skirts, but today I _____ trousers.

A. wear B. wearing
C. wears D. am wearing

16. One of my neighbors has _____ me to tea.

A. suggested B. pleased
C. invited D. welcomed

17. She doesn't like _____ television.

A. watch B. watching
C. see D. looking

18. Can we _____ at your house and go to the party together?

A. come B. find
C. meet D. see

19. It's Mr. Smith, _____?

A. is not it B. isn't he
C. is it D. isn't it

20. "Have you ever been to France?" "Yes, I _____ there last August."

A. had been B. [illegible]

21. If you _____ such a long time to get dressed, we'd have been there by now.

A. wouldn't have taken
B. hadn't taken
C. weren't taking
D. wouldn't take

22. It was so late that I _____ take a taxi.

A. have to
B. was to
C. had to
D. must

23. The guide _____ some interesting things.

A. said
B. told
C. spoke
D. talked

24. We have to read a book _____.

A. week ago
B. every three week
C. every three weeks
D. at next week

25. I _____ for this office since I arrived.

A. look
B. am looking
C. have been looking
D. was looking

26. This lovely cake is full _____ nuts.

A. of
B. with
C. -
D. from

27. I was _____ hungry that I ate six beef burgers.

A. so much
B. so
C. as
D. too

28. I don't like tea: can I have _____?

A. something else
B. anything other
C. something other
D. other thing

29. If you _____ me the book, I'll read it.

A. lend
B. will lend
C. lent
D. would lend

30.Last year she married _____ a Russian dancer.

A. to
B. with
C. on
D. -

31. He had an accident and _____ to hospital.

A. had been taken
B. has brought
C. was taken
D. took

32. If you'd written earlier, I'd have known when you _____ to go on holiday.

A. would want
B. would intend
C. wanted
D. will want

33. When the phone rang, she _____ a letter.

A. has written
B. writes
C. will write
D. was writing

A. don't read
B. hadn't read
C. didn't read
D. haven't read

35. They _____ to the cinema whenever they can.
A. have gone
B. would have gone
C. are going
D. go

36. I can't call him now because I _____ his telephone number.
A. have lost
B. have been losing
C. was lost
D. had lost

37. We invited your sister last week, but she _____.
A. didn't yet say yes
B. hasn't said yes yet
C. didn't yet say that yes
D. hadn't yet said that yes

38. I know all about her new job because I _____ her for a few minutes yesterday.
A. have seen
B. have been seeing
C. saw
D. see

39. Don't worry! When you _____ come next time, we'll talk about it.
A. -
B. should
C. will
D. would

40. While I _____ to the assistant, the manager found my receipt.
A. have been complaining
B. was complaining
C. have complained
D. complained
E.

41. That house is in a terrible state! You can see it _____ for years.
A. wasn't painted
B. isn't painted
C. hadn't been painted
D. hasn't been painted

42. "Is your sister at home?" "No, she isn't. She _____ to the theatre."
A. has gone
B. went
C. was going
D. has been going

43. The last time _____ to the library was last week.
A. I have been
B. I was
C. I went
D. I have gone

44. The tensions of the modern world _____ produced a troubled society.
A. have
B. had been
C. had
D. has

45. I'm sorry, I can't talk to you any longer because I _____ dinner.
A. 've made
B. was making
C. 'm making
D. make

46. I _____ anyone so amusingly absent-minded.
A. has never known
B. could never known

47. I don't know what the road is like now because I _____ the place for twenty years.

A. haven't seen B. don't see

C. wasn't seeing D. didn't see

48. At the meeting yesterday the president _____ to solve the problem.

A. promised B. was promised

C. had promised D. has promised

49. Oil _____ on water.

A. will float B. floats

C. used to float D. is floating

50. I can't find my dictionary; I wonder whether Mary _____ it now.

A. have B. has

C. is having D. Had

Оценки:

% правильных ответов	Количество правильных ответов	Оценка
40	0 - 20	Неудовлетворительно
60	21 - 30	Удовлетворительно
80	31 – 40	Хорошо
> 80	41 - 50	Отлично

Test 3

Прочитайте текст и ответьте на вопросы, выбрав правильный вариант ответа из предложенных ниже

ON NOT KNOWING ENGLISH

When I first came to England in 1938 I thought I knew English fairly well. In Europe my English proved quite sufficient.

In England I found two difficulties. First: I did not understand people, and secondly: they did not understand me. It was a problem for me to get words from their songs: but it was easier with written texts. Whenever I read a leading article in The Times, I understood everything perfectly well, except that I could never make out whether The Times was for or against something. In those days I put this down to my lack of knowledge of English.

The first step in my progress was when people started understanding me while I still could not understand them. This was not the most talkative period of my life, however. I reached the stage of intelligibility fairly quickly, thanks to a friend of mine who discovered an important linguistic secret, namely that the English mutter and mumble. Once we noticed a sausage like thing in a shop window marked pork brawn. We mistook it for a Continental kind of sausage and decided to buy some for our supper.

asked shopkeeper looking scared. «A quarter of pork brawn, please», I repeated, still rather casually. I repeated it again. I repeated it a dozen times with no success. I talked slowly and softly. I talked as one talks to the deaf and finally I tried baby-talk.

The shopkeeper still had no idea whether we wanted to buy or sell something. Then a brilliant idea occurred to my friend. «Leave it to me», he said and started mumbling under his nose in a hardly audible manner. The shopkeeper`s eyes lit up: «I see», he said happily, «you want a quarter of pork brawn. Why didn`t you say so? »

But the time passed and my knowledge and understanding of English grew slowly. Until the time came when, I began to be very proud of my knowledge of English. Luckily, every now and then one goes through a sobering experience which teaches one to be more humble.

Some years ago my mother came here on a visit. She expressed her wish to take English lessons at London County Council class. I accompanied her to the school and we were received by a clerk. I said that we were interested in the class for beginners. I received all the necessary information and conducted a lengthy conversation with the man, in the belief that my English sounded idiomatic. Finally, I paid the fees for my mother. He looked at me with astonishment and asked: «Only for one? And what about you?».

1. What was the only thing that the author could understand easily when first came to England?
   a) Englishmen`s speech.
   b) Songs in English.
   c) Written texts in English.
   d) What the leading article in The Times was for.

2. What progress did the author make with time?
   a) People began to understand him better.
   b) He began to understand people better.
   c) He began to speak English a lot.
   d) He discovered an important linguistic secret.

3. What helped the shopkeeper to finally understand the author and his friend?
   a) Signs and gestures.
   b) Baby-talk.
   c) Slow pronunciation of every word.
   d) Muttering of the friend.

4. When did the author feel proud of his knowledge of English?
   a) After his conversation with the shopkeeper.
   b) After living in England for some time.
   c) After he took a course of English for beginners.
   d) After his mother came to him with a visit.

5. Why did the author and his mother go to the London County Class?
   a) The author wanted to show his mother how good his English was.
   b) The author wanted to learn how much the classes were.
   c) The author`s mother wanted to learn English.
   d) The author knew the clerk there well.

II. Прочитайте предложения. Выберете слово или слова из четырех предложенных вариантов к каждому предложению

II. A.

1. What have you put into the soup? It … absolutely disgusting.
   a) Is tasted; b) tastes; c) taste; d) is tasting.

2. The hotel manager called the police when he … that a guest … without paying his bill.
   a) discovered, had left; c) discovered, had been left;
   b) has discovered, left; d) was discovered, left.

3. Don`t enter the room, it … .
   a) is being aired; b) is airing; c) is being airing; d) is aired.

4. If you hadn`t been so late for work, you … .
   a) wouldn`t have been sacked; c) will be sacked;
   b) would sack; d) would have been sacked.

5. They … your money if you … the receipt, I`m afraid.
   a) will not refund, will keep; c) don`t refund, will refund;
   b) will refund, keep; d) won`t refund, haven`t kept.

II. B.

1. – Would you like peaches or grapes?
   - … I prefer plums.
   a) Neither; b) Nothing; c) None; d) Both not.

2. The accident was your fault. If you … more carefully, it…
   a) had driven; wouldn`t have happened;
   b) have driven; shouldn`t have happened;
   c) drive; will happen;
   d) drove; would happen.

3. This school is only for children … first language is not English.
   a) whom; b) who; c) which; d) whose.

4. The teacher explained to his students that ice … at 0 C.
   a) melts; b) melted; c) melt; d) is melting.

5. What`s the name of the man …?
   a) you borrowed his car; c) which car you borrowed;
   b) whose car you borrowed; d) his car you borrowed.

Test 4

Прочитайте текст и ответьте на вопросы, выбрав правильный вариант ответа из предложенных ниже

PYGMALION AND GALATEA

A gifted young sculptor of Cyprus, named Pygmalion, was a woman- hater. He decided never to marry. His art, he told himself, was enough for him. Nevertheless, the statue he made was that of a woman. It was possible he wanted to form a perfect woman and show men that the women they had to deal with were not perfect at all.

He worked on the statue long and produced a real work of art. But Pygmalion was not content yet. He kept on working at it and daily it grew more beautiful. No woman ever born, no statue ever made, could approach it. When it was absolutely perfect, the sculptor fell in love, deeply, passionately in love with the thing he had made. It must be said that the statue did not look like a statue; it looked like a real woman, motionless for a moment only.

From this time on, no hopeless lover of a living girl was as unhappy as Pygmalion. He kissed the statue`s lips, but they could not kiss him back. For a time he tried to pretend, as children do with their toys. He would dress her in rich clothes, and imagine she was pleased. He would bring her flowers and then dream that she thanked him. But he was not a child; he could not keep on pretending. In the end he gave up. He loved a lifeless thing, so he was really unhappy.

The Goddess of Love, Venus, noticed this passion. Venus got interested, because this kind of passion was unusual. She decided to help the young man.

Cyprus was the island that first received Venus after she rose from the foam; so Venus was one of the most popular goddesses there. Pygmalion decided to ask Venus to help him, so he went to her temple. He thought it was only possible to help him to find a girl that would be like his Galatea; but Venus knew what he really wanted.

When Pygmalion came home he touched his statue. Was it an illusion, or did she really feel warm to his touch? He kissed her lips, a long kiss, and he felt her lips were soft. He touched her arms, and they softened too. It was Venus who did it, Pygmalion thought. Lie was very grateful. He put his arms around his love and saw her sin lie into his eyes.

Venus came as a guest to Pygmalion and Galatea`s wedding. Their son, Paphos, gave his name to Venus` favorite city.

1. «No woman ever born, no statue ever made, could approach it» means:
   a) no woman was allowed to approach the statue;
   b) there were no other women or statues in Pygmalion`s house;
   c) no woman or statue could compare to this one;
   d) Pygmalion kept the statue a secret from everybody.

2. Why was Pygmalion so unhappy?
   a) He was a woman-hater.
   b) He was not a child any more.
   c) He knew his love did not love him back.
   d) He knew there was no hope for him.

3. «Temple» in «so he went to her temple» means.

4. Which of the following was not mentioned in the text?
   a) Venus was interested in this unusual kind of passion.
   b) After Venus helped the lovers she kept watching them.
   c) Pygmalion played the goddess for help.
   d) Every person in Cyprus admired Pygmalion`s art.

5. From the text we can infer that ....
   a) Pygmalion was obsessed with the idea of a perfect woman;
   b) Pygmalion and Galatea lived happily ever after;
   c) Venus was a cruel goddess;
   d) Pygmalion was a selfish man.

II. Прочитайте предложения. Выберете слово или слова из четырех предложенных вариантов к каждому предложению

II. A.

1. If you can`t remember, let me ... your memory.
   a) Try to refresh; b) to try to refresh; c) to try to refresh; d) try refreshing.

2. They stopped ... some flowers on my way back.
   a) buy; b) to buy; c) buying; d) for buying.

3. ... hard, we can finish doing the test on time.
   a) to work; b) working; c) to have worked; d) having worked.

4. There ... a book, some pencils and a pen on the table.
   a) am; b) is; c) are; d) - .

5. I should have listened to you. I wish I ... your advice.
   a) took; b) had taken; c) would take; d) was taking.

II. B.

1. It was the first time Peter ... parachuting.
   a) tried; b) has tried; c) was trying; d) had tried.

2. Let`s pay them a visit, ...?
   a) shall we; b) don`t we; c) do we; d) won`t we.

3. The marathon runner ... for almost two years when he collapsed to the pavement.
   a) had run; c) has been running;

4. If she … a teacher, I think children would have liked her.
   a) become; b) had become; c) became; d) becomes.

5. When Sam …, remind him to call his boss.
   a) will return; b) returned; c) return; d) returns.

Test 5

Прочитайте текст и ответьте на вопросы, выбрав правильный вариант ответа из предложенных ниже

THE GREAT BELL OF BOSHAM

Long, long ago when men used to come sailing over the sea from Denmark and Norway to raid the coast of England, a boy at Bosham in Sussex saw a strange ship approaching the shore. Terrified he ran back to the village shouting: "The Danes are coming!"

At once everyone snatched up what they could and fled to the woods. The women took the babies, the men drove the cows, the monks in the monastery hid as many of the treasures of the church as they could, and fled to join the villagers.

When the Danes landed and scattered through the village, there was no one to be seen, for the villagers were helpless against so many strong men. The raiders carried away whatever they could find and then rushed into the church.

Now there was a peal of seven bells in the church of which the monks were very proud. They were only rung on Sundays and feast days: dong-ding, ding-dong, dong-ding, boom! The seventh bell was a very large one with a deep note.

The Danes jerked the bell ropes so that the bells swung and jangled. Pleased with the sound, the raiders carried the biggest bell away with them and set it down on the deck of their ship. They would hang it outside the Chief's Hall in Denmark, they thought. Its booming note would ring out grandly over the sea.

When the Danes were gone, the people came flocking back to their ruined huts. The monks went into the church which had been stripped of anything worth carrying. Then to cheer the villagers, they rang a peal on the bells. Ding-dong, Ding-dong, Ding-dong... But what happened to the deepest tone of the seventh bell? They rang the peal again and this time, to their astonishment, there came a boom from the sea. It was a great bell joining in from the pirates' ship. Once more it rang its deep booming note and then all was silence. The Danes had stolen so much loot and the great bell was so heavy that the ship with all those who were in it sank to the bottom of the sea.

The bell has remained on the sea-bed ever since but if you listen very carefully when the six bells are rung, you may hear a faint boom from under the sea. It's the great bell of Bosham.

raid – участвовать в налете, набеге

jangle – издавать резкие звуки, нестройно звучать
peal – звон колоколов
loot – награбленное

1. Choose the item which best describes the main idea of the first passage.
   a) It happened long, long, ago.
   b) Men from Denmark and Norway often landed on the coast of England.
   c) A ship approached the coast of Sussex.
   d) Raiders kept the inhabitants of Bosham in terror.

2. What did the Danes do after they had landed?
   a) They followed the people in the woods.
   b) They bagged whatever they could find.
   c) They destroyed the church.
   d) They killed everybody in the village.

3. In what manner did the people of Bosham enter the ransacked village?
   a) With apprehension. b) Separately. c) Secretly. d) Together.

4. What for did the monks ring the bells?
   a) To encourage their fellow- countrymen.
   b) To see whether the bells were destroyed or not.
   c) To gather the villagers.
   d) To console themselves with the magic sounds.

5. What happened to the big bell in the end?
   a) It safely arrived in Denmark.
   b) It was taken back by the English.
   c) It was drowned together with the ship.
   d) It disappeared mysteriously.

II. Прочитайте предложения. Выберете слово или слова из четырех предложенных вариантов к каждому предложению
II. A.

1. … their own house when they were living in Bristol, … they?
   a) Did they have, didn`t; c) Had they, hadn`t;
   b) They had, didn`t; d) They have had no, have.

2. - I`m exhausted. I wish I … some of the housework yesterday.
   - Sorry. I wasn`t here to help you.
   a) did; b) had done; c) would do; d) could do.

3. Next Saturday, Daisy … to Paris for a business meeting. Her secretary … already … the flight.
   a) will fly, have booked; c) is flying, has booked;

4. Florence said she … how long the meeting …, but she … home by Thursday evening.
   a) doesn`t know, will last, will return;
   b) didn`t know, would last, would have returned;
   c) didn`t know, would be lasting, would return;
   d) didn`t know, would last, would return.

5. The Academy Awards Presentation … first … in 1929 and since then, it … every year.
   a) organized, has held;
   b) organized, holds;
   c) was organized, is held;
   d) has been organized, has been held.

II. B.

1. When Simon … at the cinema, dozens of people … outside.
   a) arrived, queued;
   b) was arriving, queued;
   c) arrived, were queuing;
   d) has arrived, was queuing.

2. - … you … Paul yet?
   - No I … him when I … home.
   a) Do you phone, phone, will get;
   b) You have phoned, will phone, will get;
   c) Have you phoned, will phone, get;
   d) Did you phone, would phone, get.

3. –You had better … hard this weekend for the exam on Monday.
   - I will, but I would prefer … with my friends.
   a) study, to go out;
   b) to study, going out;
   c) study, go out;
   d) studying, going out.

4. – Tom broke his leg while he was skiing.
   - Well, if he … childishly, the accident … .
   a) won`t act, won`t happen;
   b) didn`t act, wouldn`t happen;
   c) doesn`t act, won`t happen;
   d) hadn`t acted, wouldn`t have happened.

5. I … for ten hours, so I … exhausted.
   a) had driven, felt;
   b) had been driving, felt;
   c) have been driving, felt;
   d) am driving, am felt.

Test 5

Прочитайте текст и ответьте на вопросы, выбрав правильный вариант ответа из предложенных ниже

TERRA NOVA

In June 1910 a ship left the river Thames. The name of the ship was «Terra nova» which means New Land. The name was chosen as the captain and his crew wanted to explore the unknown regions near the South Pole and, if possible, to reach the Pole itself. Robert Scott and

Scott received the news that Amundsen, the Norwegian explorer, was also on his way south and he, too, was anxious to be the first man to reach the South Pole. When they had arrived at the place called Cape Evans, they built a hut and made several short journeys. At last at the end of 1911 the captain and his four companions started for the Pole.

Right from the start Scott`s luck was out. The weather was unusually bad even for those parts. Their tent, food, oil and instruments were carried on a sledge drawn by dogs. The animals, however, died one after another, and for the greater part of the journey the men walking on skis had to pull the sledge themselves. At the back of every man`s mind was the question: «Will the Norwegians get there first? » One day the men discovered something black in the distance. Coming nearer, they saw it was a black flag tied to a pole, and footprints were to be seen everywhere. The Norwegians had reached the Pole first! That day Scott wrote in his diary: «It is a terrible disappointment and I am sorry for my companions. Tomorrow we must march on to the Pole and then hurry home».

It was 950 miles to the ship. It had taken them 76days to get to the Pole; it would take even more to get back. They pushed on at the best speed they could manage; they knew that their strength was going and food was running short. The conditions were terrible. Their sleeping bags were covered with ice all over. Evans, severely frostbitten, was the first to lose his strength. When he could no longer walk, he tried to crawl on his hands and knees. The only hope for Evans` companions now was to go on and leave him behind but they did not leave till two hours after his death. Without Evans the party moved a little quicker, but the weather grew worse with snowstorms and terrible cold, and they had not enough fuel to warm their feed. Gates was suffering most from frost-bite and could not pull the sledge; indeed he could hardly walk. He knew that he was slowing the progress of his which meant death for them. He slept through the night, hoping that he would not wake, but in the morning he was still alive. He said to his friends, «I am going outside and may be some time». He never came back.

They came at last to a shop only eleven miles from the place where they had left a store of food and fuel, but the storm was so violent that they had to stay where they were. In spite of the cold and hunger Scott and his companions lived four days longer and died there in their tent.

Eight months later a search party found that silent tent. They were lying in their sleeping bags as they had died. The body of Gates was never found, but somewhere about the place where he went away they put up a heap of stones with the words: «Here died a very gallant Gentleman, Captain L.E.G. Gates, who in March 1912 walked to his death in a storm to try save his companions».

1. What did Robert Scott and his crew wants to do?
   a) To explore the New Land.
   b) To explore the unknown regions near the South Pole and to reach the Pole itself.
   c) To overtake the Norwegian expedition.
   d) To explore Australia.

2. What news did the captain receive in Australia?
   a) The Norwegian had already reached the South Pole.
   b) The weather was going to be worse.
   c) Amundsen`s expedition was also on the way to the South Pole.
   d) It was impossible to reach the South Pole.

3. When did Scott`s expedition start for the Pole?

b) Soon after they reached Cape Evans.
c) About a year and a half after the ship left the Thames.
d) 76days after the beginning of the journey.

4. How many of Scott`s companions died together with him in the tent?
a) five; b) four; c) three; d) two.

5. Which of the following helped people to learn what had happened to Scott and his companions?
a) Scott`s diary.
b) The Norwegians had witnessed everything.
c) Those who had survived told them.
d) The footprints on the snow which were clearly seen everywhere.

II. Прочитайте предложения. Выберете слово или слова из четырех предложенных вариантов к каждому предложению

II. A.

1. – Would you mind… tonight?
- Not really. I`m exhausted. I … hard all day.
a) to go out, have worked; c) going out, am working;
b) going out, have been working; d) go out, work.

2. It`s late. Mark … so far. He may… the company of his friends.
a) did not come, preferred; c) has not come, have preferred;
b) does not come, has preferred; d) comes, prefers.

3. Last night, a bomb … outside the main branch of the Trusty Bank in Barton. The police … an anonymous phone call minutes before the explosion.
a) was exploding, had received; c) had exploded, received;
b) exploded, has received; d) exploded, had received.

4. Don`t enter the bedroom! The child … there, and he always … when somebody … the door.
a) sleeps, wakes up, opens; c) sleeps, is waking up, open;
b) is sleeping, wakes up, opens; d) is sleeping, is waking up, open.

5. – What … we … if John … about the party?
- We`ll pretend we don`t know anything about it.
a) will we say, ask; c) shall we say, asks;
b) did we say, would ask; d) would we say, asked.

1. Yesterday I saw an old man … into your house. He … absolutely helpless and upset.
   a) came, looked;
   b) came, was looking;
   c) come, looked;
   d) come, was looking.

2. – They … a party for Susan`s birthday on Sunday.
   - I know, but it`s a secret. So you`d better … about it in case she ….
   a) will organize, don`t talk, will hear;
   b) are organizing, not talk, hears;
   c) will be organizing, not to talk, hears;
   d) are going to organize, not to talk, will hear.

3. – I felt very tired at work today.
   - Well, if you… the late film, you … so tired.
   a) didn`t see, didn`t feel;
   b) hadn`t seen, wouldn`t have felt;
   c) didn`t see, wouldn`t feel;
   d) didn`t see, don`t feel.

4. Floods … when a river … its banks.
   a) are caused, bursts;
   b) caused, is burst;
   c) cause, bursts;
   d) are caused, is burst.

5. Sarah wanted to know … her a lift to work tomorrow.
   a) whether I would give;
   b) if shall I give;
   c) I would give;
   d) if I shall give.

Test 6

Прочитайте текст и ответьте на вопросы, выбрав правильный вариант ответа из предложенных ниже

HUMPHREY BOGART

Humphrey Bogart was born on Christmas Day in 1899, the son of Dr Belmont DeForest Bogart, and eminent New York doctor. His face soon became familiar to the American public, for when he was only one year old he was chosen to do advertisements for baby food. He went to very expensive schools, but at 18 he failed his entrance exams for Vale University, which displeased his father very much, and ran away to join the navy. The war was over by then, but he returned with the scar on his lip, the result of a blow from a prisoner when he was on guard duty.

In New York he began acting in small theatre parts, but nobody thought he had much talent. In 1930 he had his first Hollywood screen test, which was a success, but after a year his contract was terminated and he returned to New York. During the Depression, when theatre work was difficult to find, he was sometimes able to earn a living only by playing chess for money in cafes and bars.

His first gangster part came in 1936, when he was cast as Duke Mantee in the Broadway

wanted Edward 0. Robinson as Mantee, but the star Leslie Howard, insisted on Bogart. Warners agreed and this gave Bogart his first Hollywood break, but for a few years the studio did not give him good parts because it already had James Cagney, Edward G. Robinson and George Raft for gangster roles.

Looking back on this early part of his career, Bogart later said, « In my first thirty-four films, I was shot in twelve, electrocuted or hanged in eight, and a jailbird in nine». His private life was also full of ups and downs. His third marriage, to a temperamental actress called Mayo Methot, was at times, so violent that it was almost like acting in another gangster film.

But his luck was beginning to change. In the film *High Sierra* (1940), he was given the part of the aging gangster, but only because Cagney, Raft and Robinson refused it and with his performance at last won the studio`s respect. And then came *Casablanca,* with Ingrid Bergman (1942), the film that finally brought him fame: He was forty-two.

In his private life too, things improved. The year after Casablanca while he was making the film of Hemingway`s *To Have Not* he fell deeply in love with his nineteen-year-old co-stair, the then unknown Lauren Bacall. Two years later, after he divorced Mayo, they married, and were inseparable until his early death from cancer in 1957.

1. Humphrey Bogart became popular with the American public for when he was chosen to.

   a) do baby food promotion;
   b) do commercials for baby food;
   c) do researches in baby food;
   d) do inventions of baby food.

2. All of the following statements about Bogart are true except one.

   a) His face became familiar to the American public when he was only one year old.
   b) In the 1930s he had to earn his living by playing chess for money.
   c) He played Duke Mantee on Broadway.
   d) He failed when he was making Casablanca.

3. In his twenty films Humphrey Bogart.
   a) committed suicide;
   b) committed murders;
   c) did violently;
   d) was shot.

4. After the film «Casablanca».
   a) Humphrey`s luck changed from good to bad.
   b) Humphrey`s life changed for the better.
   c) Humphrey had to give up his work.
   d) Humphrey got large profits.

5. In 1931 Humphrey Bogart`s contract.
   a) was extended; b) was banned; c) was cancelled; d) was ended.

II. . Прочитайте предложения. Выберете слово или слова из четырех предложенных

II. A .

1. Fire … through a furniture ware-house yesterday afternoon. The police… the cause of the fire.
   a) was swept, is investigating; c) sweeps, is looking;
   b) swept, are being investigated; d) swept, are investigating.

2. He`d better accept their offer,…?
   a) wouldn`t he; b) didn`t he; c) shouldn`t he; d) hadn`t he.

3. I remember the day when the teacher explained to us that water … of oxygen and hydrogen. I … in chemistry since then.
   a) consists; have been interested; c) is consisting; am interested;
   b) consisted; was interested; d) consisted; had been interested.

4. Something … to my washing machine. I cannot make it… .
   a) happened, works; c) has happened, work;
   b) have happened, to work; d) happens; working.

5. – Why … you … so much beer?
   - We … a party tonight.
   a) do you buy, will have; c) have you bought, shall be having;
   b) are you buying, are having; d) you bought, shall have.

II.B.

1. -I`ve lost my keys again, Dad.

   -If you … them on the table, you … them.
   a) put, won`t lose; c) put, wouldn`t lose;
   b) had put, wouldn`t have lost; d) have put, don`t lose.

2. –I … just my driving test.
   - Congratulations. I wish I … a car.
   a) have just passed, could drive; c) passed, can drive;
   b) passed, will drive; d) am just passing, am driving.
3. When I arrived she … for me. She looked angry as she … for a long time already.
   a) waited, had been waiting; c) was waiting, was waiting;
   b) was waiting, had been waiting; d) had been waiting; had waited.
4. - It`s no use … to her, she just doesn`t understand.
   - You`d better … it by yourself.
   a) talking, do; b) to talk, do; c) talk, to do; d) having talked, did.
5. My friend said that he … the material at home and the results of the test … had

b) had not revised, were; d) revised, are.

Part 2

Факультет ИЯЭиТФ

Специальность "Тепловые станции"

1. Прочитайте тексты и ответьте на вопросы, выбрав вариант ответа "True" (правильно), "False" (неправильно), "Not stated" (не указано, т.е. на основании текста нельзя дать ни положительного, ни отрицательного ответа)

Text 1.

Type of Steam generator unit used in coal-fired power plants

The steam generator or boiler is an integral component of a steam engine when considered as a prime mover; however it needs be treated separately, as to some extent a variety of generator types can be combined with a variety of engine units.

A boiler incorporates a firebox or furnace in order to burn the fuel and generate heat; the heat is initially transferred to water to make steam; this produces saturated steam at ebullition temperature saturated steam which can vary according to the pressure above the boiling water.

The higher the furnace temperature, the faster the steam production.

The saturated steam thus produced can then either be used immediately to produce power via a turbine and alternator, or else may be further superheated to a higher temperature; this notably reduces suspended water content making a given volume of steam produce more work and creates a greater temperature gradient in order to counter tendency to condensation due to pressure and heat drop resulting from work plus contact with the cooler walls of the steam passages and cylinders and wire-drawing effect from strangulation at the regulator.

Any remaining heat in the combustion gases can then either be evacuated or made to pass through an economiser, the role of which is to warm the feed water before it reaches the boiler.

Agree or disagree (point out if not stated):

1) A boiler incorporates a firebox or a furnace in order to burn the fuel.

2) The source of heat for a boiler is combustion of any of several fuels, such as wood, coal, oil, or natural gas.

3) The superheater works like coils on an air conditioning unit, however to a different end.

4) The produced saturated steam can be used immediately to produce power via a turbine.

5) The lower the furnace temperature, the faster the steam production.

6) The smaller temperature gradient is created in order to counteract the heat drop.

7) The temperature of saturated steam may vary in time.

agriculture as well for soil steaming.

9) The function of the economizer is to warm the feed water before it enters the boiler.

10) Feed water for boilers needs to be as pure was possible with a minimum of suspended solids and dissolved impurities.

Text 2.

Since there is continuous withdrawal of steam and continuous return of condensate to the boiler, losses due to blowdown and leakages have to be made up to maintain a desired water level in the boiler steam drum. For this, continuous make-up water is added to the boiler water system. Impurities in the raw water input to the plant generally consist of calcium and magnesium salts which impart hardness to the water. Hardness in the make-up water to the boiler will form deposits on the tube water surfaces which will lead to overheating and failure of the tubes. Thus, the salts have to be removed from the water, and that is done by a water demineralizing treatment plant (DM). A DM plant generally consists of cation, anion, and mixed bed exchangers. Any ions in the final water from this process consist essentially of hydrogen ions and hydroxide ions, which recombine to form pure water. Very pure DM water becomes highly corrosive once it absorbs oxygen from the atmosphere because of its very high affinity for oxygen.

The capacity of the DM plant is dictated by the type and quantity of salts in the raw water input. However, some storage is essential as the DM plant may be down for maintenance. For this purpose, a storage tank is installed from which DM water is continuously withdrawn for boiler make-up. The storage tank for DM water is made from materials not affected by corrosive water, such as PVC. The piping and valves are generally of stainless steel. Sometimes, a steam blanketing arrangement or stainless steel doughnut float is provided on top of the water in the tank to avoid contact with air. DM water make-up is generally added at the steam space of the surface condenser (i.e., the vacuum side). This arrangement not only sprays the water but also DM water gets de-aerated, with the dissolved gases being removed by a de-aerator through an ejector attached to the condenser.

Agree or disagree (point out if not stated):

1) Potassium and manganese salts impart hardness to the water
2) Water demineralizing treatment plant removes salt from the water
3) A DM plant consists of cation and anion exchangers only
4) Any ions in the final water consist essentially of oxygen and hydroxide ion, which recombine to form pure water
5) The capacity of the DM plant depends on the type and quantity of salts in the raw water
6) The storage tank for DM water is made from materials such as austenitic steel
7) The piping and valves are usually made of stainless steel
8) The DM plant does not need maintenance
9) The DM plant also disinfects the water from harmful bacteria
10) DM water make-up is added at the steam space of the surface condenser

Text 3

Geothermal energy, form of energy conversion in which heat energy from within Earth is

captured and harnessed for cooking, bathing, space heating, electrical power generation, and other uses. Heat from Earth's interior generates surface phenomena such as lava flows, geysers, fumaroles, hot springs, and mud pots. The heat is produced mainly by the radioactive decay of potassium, thorium, and uranium in Earth's crust and mantle and also by friction generated along the margins of continental plates. The subsequent annual low-grade heat flow to the surface averages between 50 and 70 megawatts (mW) per square meter worldwide. In contrast, incoming solar radiation striking Earth's surface provides only 342 watts per square meter annually. Geothermal heat energy can be recovered and exploited for human use, and it is available anywhere on Earth's surface. The estimated energy that can be recovered and utilized on the surface is 4.5×10^7 exajoules, or about 1,400,000 terawatt-years, which equates to roughly three times the world's annual consumption of all types of energy. Comparing the benefits of geothermal energy with other renewable energy sources, the main advantage of geothermal energy is that its base load is available 24 hours per day, 7 days per week, whereas solar and wind are available only about a third of the time. In addition, the cost of geothermal energy varies between 5 and 10 cents per kilowatt-hour, which can be competitive with other energy sources, such as coal.

Agree or disagree (point out if not stated):

1) The sun provides more energy than geothermal sources (in terms of Earth's surface square meter).
2) The geothermal energy is produced by the radioactive disintegration of potassium, thorium, and uranium in Earth's crust.
3) Locating and developing high-temperature geothermal resources is very challenging.
4) The estimated energy of geothermal sources is sufficient to cover the world's consumption.
5) Geothermal energy can be used to generate electricity.
6) Solar and wind are better renewable energy sources than geothermal sources.
7) The annual low-grade heat flow to the surface can be as high as 100 megawatts per square meter worldwide.
8) Geothermal heat energy is hard to be recovered and exploited for human use.
9) The main drawback of geothermal energy is that its base load is available 24 hours per day.
10) Heat from Earth's interior generates a variety of surface phenomena.

Text 4

Thermal Power Engineering

Thermal Power Engineering is the branch of heat engineering that deals with the

conversion of heat into other forms of energy, mainly mechanical and electric. Mechanical energy is generated from heat in heat engines, which power, for example, machine tools, automobiles, and conveyors; the mechanical energy from heat engines also drives certain types of electric generators. The devices in which heat is converted into electric power without the use of an electric generator are known as direct-power generators. Such devices include magnetohydrodynamic generators, thermoelectric generators, and thermionic power generators.

The conversion of heat into mechanical energy in heat engines is based on the ability of a gaseous or vaporous substance to perform mechanical work during a change in volume. The working substance (gas or vapor) must complete a closed sequence of thermodynamic processes, that is, a cycle. During the cycle, a certain quantity of heat Q_1 is withdrawn from one or more heat sources, and a lesser quantity of heat Q_2 is returned to one or more heat sources; here, the difference $Q_1 - Q_2$ is converted into mechanical work A_{theor}. The ratio of the work produced to the heat expended is known as the thermal efficiency of the cycle:

$$\eta_t = \frac{A_{theor}}{Q_1} = \frac{Q_1 - Q_2}{Q_1} = 1 - \frac{Q_2}{Q_1} \quad (1)$$

In the simplest case, a cycle can be carried out with a single heat source at a temperature T_1 that imparts heat to the working substance and a single heat source at a temperature T_2 that receives heat from the working substance. For this temperature interval $T_1 - T_2$, the highest efficiency $\eta_c = 1 - T_2/T_1$ is that of the Carnot cycle, that is, $\eta_c \geq \eta_t$. An efficiency equal to unity, that is, a total conversion of the heat Q_1 into work, is possible only when $T_1 = \infty$ or $T_2 = 0$. Of course, neither of these conditions is possible. It must be stressed that under terrestrial conditions the temperature T_2 in the apparatus used in thermal power engineering must at best be assumed equal to the temperature T_e of the environment (air, body of water). A heat source having a temperature $T_2 < T_e$ can be created only by using a refrigerating engine, which in general requires the expenditure of work for its own operation. The impossibility of a total conversion of heat into work where all substances participating in the conversion return to their original state is established by the second law of thermodynamics.

Since the processes that occur in actual devices for converting heat into other forms of energy are accompanied by various losses, the actual work A_{act} done proves to be less than the work A_{theor} that is theoretically possible. The ratio of actual to theoretical work is called the relative effective efficiency of the device η_{re}, that is,

$$\eta_{re} = \frac{A_{act}}{A_{theor}} \quad (2)$$

$A_{act} = Q_1 \cdot \eta_t \cdot \eta_{re} = Q_1 \cdot \eta_e$

where $\eta_e = \eta_t \cdot \eta_{re}$ is the effective efficiency of the device. Other conditions being equal, the efficiency of converting heat into work depends on the temperature at which the heat is transferred to the working substance. The maximum work obtainable from a quantity of heat Q withdrawn at temperature T_1 with a temperature T_e of the surrounding medium is called the efficiency of the heat, or energy, l_a, that is,

(3) $$l_a = Q \cdot \eta_c = Q \frac{T_1 - T_e}{T_1}$$

We see from equation (3) that when $T_1 = T_e$, the heat energy is equal to zero.

In its most complete form, an engine for converting heat into mechanical work (heat engine) includes a working substance that is carried through a closed sequence of thermodynamic processes (a cycle), systems for supplying heat to the working substance from some source of heat energy, one or more machines that either receive work from or perform work on the working substance, and a system for transferring heat from the working substance to the environment. A distinction is made between engines in which heat is supplied to the working substance from an external source (in a heat exchanger) and engines with an internal supply (with the working substance in the form of combustion products).

Agree or disagree (point out if not stated):

1) In the area of direct-power generators heat is converted into electric power by the electric generator.

2) The conversion of heat into mechanical energy inside heat engines is based on the ability of a gaseous or vaporous substance to perform mechanical work during a change in volume.

3) Heat engine always operates in a temperature difference.

4) Engine for converting heat into mechanical work (heat engine) includes: a working substance, systems for supplying heat to the working substance from some source of heat energy, one or more machines that either receive work from or perform work on the working substance, and a system for transferring heat from the working substance to the environment.

5) The ratio of the heat expended to the work produced is known as the thermal efficiency of the cycle.

6) Carnot cycle is a reversible circular process which includes the transformation of

7) The source of heat with the temperature below the temperature of the environment may be created with the device.

8) The relative efficiency of the device is the ratio of the actual and theoretical work.

9) Thermal Power Engineering is a branch of heat engineering that deals with the conversion of heat into thermal and electric energy

10) The working substance in a thermodynamic cycle is water

2. Прочитайте тексты и подберите подходящие по смыслу слова из списка, предложенного под текстами.

Text 1

Almost all coal, nuclear, geothermal, solar thermal electric, and waste incineration plants, as well as many natural gas power plants are (…)[1]. Natural gas is frequently combusted in (…)[2] as well as boilers. The waste heat from a gas turbine can be used to raise (…)[3], in a combined cycle plant that improves (…)[4] Power plants burning coal, fuel oil, or natural gas are often called (…)[5] power plants.

Commercial electric utility power stations are usually constructed on a large scale and designed for (…)[6] operation. Electric power plants typically use three-phase electrical (…)[7] to produce (…)[8] electric power at a frequency of 50 Hz or 60 Hz. (…)[9] may have their own power plants to supply heating or electricity to their facilities, especially if steam is created anyway for other purposes. Steam-driven power plants have been used in various (…)[10], but are now usually used in large naval ships. Shipboard power plants usually directly couple the turbine to the (…)[11] through gearboxes. Shipboard steam power plants can be either fossil fuel or nuclear. Nuclear marine propulsion is, with few exceptions, used only in (...)[12]. There have been perhaps about a dozen turbo-electric ships in which a steam-driven turbine drives an electric generator which powers an (…)[13] for propulsion.

The boiler (…)[14] used in the steam boiler is a means of transferring heat energy from the (…) [15] to the mechanical energy of the spinning (…)[16]. The total feed water consists of recirculated condensate water and (…)[17]. Because the (…)[18] materials it contacts are subject to (…)[19] at high temperatures and pressures, the makeup water is highly purified before use. The (…)[20] cycle begins with condensate water being pumped out of the condenser after traveling through the steam turbines.

The water is pressurized in two stages, and flows through a series of six or seven intermediate feed water heaters, (…)[21] up at each point with steam extracted from an appropriate duct on the turbines and gaining (…)[22] at each stage. Typically, in the middle of this series of feedwater (…)[23], and before the second stage of pressurization, the condensate plus the makeup water flows through a deaerator that removes dissolved (…)[24] from the water, further purifying and reducing its corrosiveness. The water may be dosed following this point with hydrazine, a (…)[25] that removes the remaining oxygen in the water to below 5 parts per billion (ppb).[vague] It is also dosed with pH control agents such as ammonia or morpholine to keep the residual (…)[26] low and

(...)[27] are provided to give sufficient air for combustion. The Primary air fan takes air from the (...)[28] and, first warming it in the air preheater for better combustion, injects it via the air nozzles on the (...)[29].

The induced draft fan assists the FD fan by drawing out combustible gases from the furnace, maintaining a slightly (...)[30] pressure in the furnace to avoid backfiring through any closing.

1 a) thermal
b) nuclear
c) renewable energy
d) bioenergy

2 a) steam turbine
b) gas-stove
c) gas turbines
d) pipes

3 a) steam
b) water
c) flue gases
d) gas

4 a) staff efficiency
b) overall efficiency
c) generation of electricity
d) power

5 a) nuclear
b) fossil-fuel
c) condensing
d) atomic

6 a) frequent
b) continuous
c) rarely
d) never

7 a) generators
b) turbines
c) ejector
d) economizer

8 a) heat
b) direct current
c) alternating current
d) water flow

b) kindergartens
c) schools
d) universities

10 a) submarine
b) large ships
c) plane
d) hybrid cars

11 a) heating ship
b) water heating
c) ship's propellers
d) vessel

12 a) naval vessels
b) airliners
c) cars
d) bicycles

13 a) electric motor
b) internal combustion engine
c) turbine
d) pipe

14 a) dirty water
b) service water
c) feed water
d) pure water

15 a) burning fuel
b) of burnt
c) boiler
d) vapor

16 a) deaerator
b) steam turbine
c) condenser
d) boiler

17 a) purified makeup water
b) makeup steam
c) service water
d) oxygen

18 a) concrete
b) plastic
c) metallic
d) liquid

19 a) oxidation
b) corrosion
c) flaking
d) heating

20 a) feed water
b) fuel
c) energy
d) flow

21 a) heated
b) cooled
c) evaporated
d) frozen

22 a) temperature
b) pressure
c) density
d) velocity

23 a) refrigerant
b) steam generators
c) heaters
d) steam pipe

24 a) air
b) solids impurities
c) oxygen
d) helium

25 a) special device
b) chemical
c) inert gas
d) gasoline

26 a) alkalinity
b) activity
c) acidity
d) lucidity

27 a) external fans
b) exhauster
c) air preheater
d) condenser

28 a) cooler
b) air preheater
c) atmosphere
d) condenser

29 a) blower
b) firebed surface
c) furnace wall
d) container

30 a) vacuum
b) negative
c) positive
d) water

Text 2.

Combustion

The source of ( )[1] for a boiler is combustion of any of several fuels, such as wood, coal, oil, or natural gas. Nuclear fission is also used as a heat source for generating steam. Heat recovery ( )[2] generators (HRSGs) use the heat rejected from other processes such as gas turbines.

Solid fuel firing

In order to improve the ( )[3] characteristics of the fire, ( )[4] needs to be ( )[5] through the grate, or more importantly above the fire. Most ( )[6] now depend on mechanical draft equipment rather than natural draught. This is because natural draught is subject to outside air conditions and ( )[7] of flue gases leaving the furnace, as well as ( )[8]. All these factors make effective draught hard to attain and therefore ( )[9] mechanical draught equipment much more economical. There ( )[10] three types of mechanical draught:

1 Induced draught: This is obtained by one of three ways, the first being the "stack effect" of a heated chimney, in which the ( )[11] is less dense than the ambient ( )[12] surrounding the boiler. The denser column of ambient air forces combustion air ( )[13] and through the boiler. The second method is through use of a ( )[14] jet. The steam jet or ejector ( )[15] in the direction of ( )[16] flow induces flue gases into the stack and allows for a greater flue gas velocity increasing the overall draught in the furnace. This method was common on steam driven locomotives which could not have ( )[17] chimneys. The third method is by simply using an induced ( )[18] which sucks flue gases out of the furnace and up the stack. Almost all induced draught furnaces ( )[19] a negative pressure.

2 Forced draught: draught is obtained by forcing ( )[20] into the furnace by means of a ( )[21] and ductwork. Air is often passed through an air ( )[22]; which, as the name suggests, heats the air going into the furnace in order to increase the overall efficiency of the ( )[23]. Dampers ( )[24] used to control the quantity of air admitted to the furnace. Forced draught furnaces usually have a ( )[25].

3 Balanced draught: Balanced draught is obtained through use of both induced and forced draft. This is more common with ( )[26] boilers where the flue gases have ( )[27] a long distance ( )[28] many boiler passes. The induced draft fan works in conjunction with the forced draft fan allowing the furnace ( )[29] to be maintained slightly ( )[30] pressure in the furnace to avoid backfiring through any closing.

1 a) energy
b) power
c) heat
d) temperature

2 a) steam
b) water
c) air
d) gas

3 a) burning
b) burned
c) burn
d) to burn

4 a) the exhaust gases
b) argon
c) gas
d) air

5 a) served
b) to climb
c) supplied
d) flow

6 a) preheater
b) boilers
c) turbines
d) burner

7 a) temperature
b) pressure
c) flow
d) energy

8 a) chimney height
b) length of pipelines
c) chimney diameter
d) diameter pipelines

9 a) do
b) make
c) form
d) design

10 a) is
b) are
c) the
d) in

11 a) air
b) gas
c) flue gas
d) heated air

12 a) air
b) gas
c) flue gas
d) heated air

13 a) for
b) in
c) a
d) into

14 a) air
b) water
c) steam
d) gas

15 a) orienting
b) is oriented
c) to orient
d) oriented

16 a) air
b) gas
c) flue gas
d) heated air

17 a) narrow
b) wide
c) low
d) tall

18 a) draught fan
b) compressor
c) pump
d) pipe

19 a) to have
b) have
c) had
d) to had

20 a) the exhaust gases
b) argon
c) gas
d) air

21 a) draught fan
b) compressor
c) pump
d) fan

22 a) heater
b) cooler
c) compressor
d) fan

23 a) preheater
b) boilers
c) turbines
d) burner

24 a) is
b) are
c) the
d) a

25 a) increase in temperature
b) drop in temperature
c) positive pressure
d) the increase of consumption

26 a) small
b) larger
c) medium
d) absent

27 a) traveling
b) to travel
c) travel

d) travels

28 a) in
b) for
c) a
d) through

29 a) temperature
b) pressure
c) flow d) mass
d) energy

30 a) below atmospheric
b) above the level
c) below the level
d) below the estimated

Text 3
NUMERO DOS

The amount of usable _____(1)from geothermal sources varies with depth and by extraction method. The increase in _____(2) of rocks and other materials underground averages 20–30 °C per kilometre (58–86 °F per mile) depth worldwide in the upper part of the ____(3), and this rate of increase is much higher in most of Earth's known geothermal ____(4). Normally, heat extraction requires a _____(5) to bring the energy to the surface. Locating and developing geothermal resources can be ____(27). This is especially true for the high-temperature resources needed for generating_____ (6). Such resources are typically limited to parts of the world characterized by recent _____(7) or located along plate boundaries or within crustal ____(28). Even though there is a continuous source of heat within _____(8), _____(9) extraction rate of the heated fluids and steam can exceed the replenishment rate, and, thus, use of the _____(10) must be managed sustainably.

_____(30) energy is best found in areas with _____(11) thermal gradients. These gradients occur in regions affected by _____(12) volcanism, in areas located along

plate boundaries (such as along the Pacific Ring of Fire), or in____(20) areas marked by thin crust (hot spots) such as Yellowstone National Park and the Hawaiian Islands.
The heated fluid from a geothermal ____(21) is tapped by drilling _____(13), sometimes as deep as 9,100 metres and is extracted by ____(14) or by natural artesian flow (where the weight of the water forces it to the surface). Water and steam are then piped to the power plant to generate electricity or through insulated pipelines—____(29) may be buried or placed aboveground—for use in ____(15) and cooling applications. In general, _____(22)pipelines are limited to roughly 1.6 km (1 mile) in length to minimize heat ___(16) in the steam. However, direct-use pipelines spanning several tens of kilometres have been installed with a temperature loss of less than 2–5 °C (3.6–9 °F),____(17) depending on the flow rate. The most economically efficient facilities are located close to the geothermal resource to ____(18) the expense of constructing long pipelines. In the case of electric power generation, costs can be kept down by locating the facility _____(19) electrical transmission lines to transmit the electricity to market.
The main disadvantage of geothermal energy development is the high initial investment ____(23) in constructing the facilities and infrastructure and the high ____(24) of proving the resources. (Geothermal resources in low-permeability rocks are often found, and exploration activities often drill "dry" holes—that is, holes that produce ____(25) in amounts too low to be exploited economically.) However, once the resource is proven, the annual cost of ____(26) (that is, hot water and steam) is low and tends not to escalate in price.

1 a) power; b) energy; c) heat; d) entropy
2 a) temperature; b) pressure; c) flow; d) velocity

3 a) atmosphere; b) crust; c) lithosphere; d) magnetosphere
4 a) crusts; b) caverns; c) areas; d) volumes
5 a) steam; b) water; c) heated air; d) gas
6 a) pressure; b) electricity; c) gas; d) water
7 a) volcanic activity; b) hurricane; c) landslide; d) sandstorm
8 a) Sun; b) Moon; c) Earth; d) Pluto
9 a) the; b) a; c) an; d) --
10 a) resource; b) electricity; c) temperature; d) heat
11 a) low; b) high; c) medium; d) absent
12 a) ocean; b) magma; c) recent; d) mountain
13 a) rig; b) company; c) wells; d) rock
14 a) pumping; b) heating; c) releasing; d) evaporating
15 a) pumping; b) heating; c) releasing; d) evaporating
16 a) loss; b) profit; c) pumping; d) running
17 a) holding; b) depending; c) rising; d) declining
18 a) minimize; b) maximize; c) average; d) integrate
19 a) far; b) separate; c) near; d) under
20 a) into; b) in; c) on; d) after

21 a) resource; b) electricity; c) temperature; d) electric field
22 a) electric power plant; b) oil; c) underground; d) steam
23 a) problem; b) cost; c) risk; d) profit
24 a) problem; b) cost; c) risk; d) profit
25 a) steam; b) gas; c) heated air; d) liquid nitrogen
26 a) oil; b) hydrocarbons; c) fuel; d) polyamines
27 a) challenging; b) easy; c) dodging; d) puzzling
28 a) cold spots; b) hot spots; c) areas; d) volume
29 a) which; b) when; c) whom; d) whose
30 a) kinetic energy; b) geothermal energy; c) electrical energy; d) mechanical energy

Text 4.

Nonnuclear thermal power plants.

The heat engines in steam-electric power plants are the basic units of modern (1975) thermal power engineering. These plants comprise a boiler unit and a steam turbine. In the USSR, more than 80 percent of all electric power is produced (1975) in such plants. District heat and power plants are usually constructed in large cities, while condensation electric power plants are favored in regions where fuel is cheap.

District heat and power plants differ from condensation plants in that they provide the consumer not only with electric power but also with heat, via the feed water, which is heated in boilers to temperatures up to 150°–170°C. The water is fed through pipes to apartment complexes, where it is either used directly or passed through intermediate heat exchangers to provide space heating and to heat water for the building. In addition to extractions for purposes of regeneration, there may be one or more controlled extractions for heating systems from the turbines in district heat and power plants. The operation of the turbines depends on the demand for heat, and during the colder part of the year almost no steam reaches the condenser. Space heating from district heat and power plants is more economical than from individual boilers or even central boilers because the feedwater at district heat and power plants is preheated by the spent steam, whose temperature (and, thereby, energy) is only slightly above the temperature of the feedwater.

A simplified schematic diagram of a condensation steam-turbine electric

power plant is shown in Figure 1. The fuel (coal, mazut, natural gas) is burned in the combustion chamber of the boiler unit. The air required for combustion, which is first heated by gases leaving the boiler unit in a recuperative air heater, is fed to the combustion chamber by a forced-draft fan. The combustion products give up their heat to both the water and the steam in various elements of the boiler unit and then pass at a temperature of 130°–150°C through an ash collector to an exhaust fan, which discharges the products through the chimney.

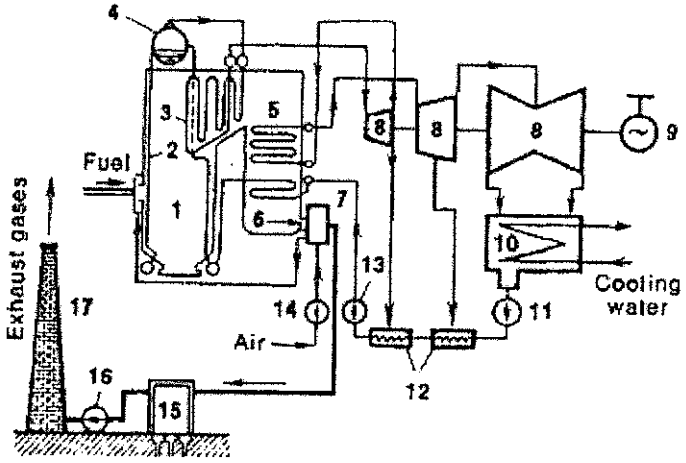

Figure 1 - Design of a condensation steam-turbine electric power plant: (1) boiler furnace, (2) boiler tubes, (3) steam superheater, (4) steam drum, (5) reheat superheater, (6) economizer, (7) air heater, (8) steam turbine, (9) generator, (10) condenser, (11) condenser pump, (12) regenerative preheater, (13) feedwater pump, (14) blower, (15) ash collector, (16) exhaust fan, and (17) chimney

Steam is the working substance that converts the heat into mechanical work. Superheated steam passes from the superheater into a steam turbine. The steam pressure prior to entering the turbine in large electric power plants reaches 35 meganewtons per sq m (MN/m^2) at a temperature of 650°C. Within the turbine, the steam passes through fixed nozzles into channels formed by curved blades mounted on a rotor and, by giving up its energy, turns the rotor. The mechanical energy of the turbine's rotor is converted into electric energy in the generator. The steam turbine usually requires two or three housings. Steam from the part of the turbine in the first housing is passed to the part in the second housing, sometimes

being returned to the steam generator for intermediate reheating in the superheater. Spent steam from the turbine passes to the condenser, where a pressure of 0.003–0.005 MN/m^2 and a temperature of 25°–29°C are maintained. The condensate obtained is pumped into a system of regenerative preheaters, where it is heated to 230°–260°C by steam taken from the turbine, and is then pumped to an economizer. From the economizer, the water enters the steam drum, from which it passes through boiler tubes on the walls of the combustion chamber. The water is partially evaporated in the tubes, and the steam-water mixture is returned to the drum. There the saturated steam is separated from the water and passed first to the superheater and then to the turbine; the water is returned to the boiler tubes. To generate steam having supercritical parameters (pressures above 24 MN/m^2), flow-through boilers are used.

Cooling water is supplied to the condenser from natural or artificial bodies of water, to which it is returned after being heated by several degrees. The temperature of the cooling water is ultimately restored to the previous level owing to evaporation of part of the water. When there are no bodies of water of sufficient size, the cooling water is circulated through a closed loop and subjected to air cooling in evaporative coolers of the tower type called cooling towers. In regions where sufficient water is lacking, dry cooling towers are used in which the cooling water transfers its heat to the air through the wall of a heat exchanger.

In gas-turbine power plants, the heat engine is a gas-turbine engine. Here, fuel (natural gas, mazut) and air compressed to several MN/m^2 are fed into the combustion chamber. Combustion of the fuel involves a high excess of air coefficient (2–4), which acts to lower the temperature of the combustion products entering the gas turbine. After leaving the turbine, the combustion products either give up part of their heat in a regenerator to air introduced into the combustion chamber or, in simpler systems, are discharged through the chimney. The mechanical energy of the turbine's rotor is converted into electric energy in the generator, but part is expended in driving the compressor.

Steam-gas turbine installations, in which there is a combined cycle

involving both gas and steam turbines, hold great promise. Depending on the design for heat flow, these installations fall into two categories. In the first, steam at a pressure of 0.6–0.7 MN/m^2 from a high-pressure steam generator is directed into the steam turbine; the combustion products enter the gas turbine, which is used to drive the air compressor and electric generator. In the second type of installation, the hot exhaust gases from the gas-turbine unit either enter the furnace of the steam boiler in order to increase the temperature or serve to heat the feedwater in the boiler's economizer. Compared with steam-turbine plants having the same capacity and parameters, a steam-gas turbine installation consumes 4–6 percent less heat.

In diesel power plants, the electric generators are driven by diesel engines rather than by turbines, as in most thermal power plants. Diesel plants are used to supply electric power in regions distant from transmission lines; they are also used when it is not possible to build hydroelectric plants or other types of thermal power plants. The capacity of these plants can exceed 2.2 MW.

1) The combustion products give up their heat to both the water and the steam in various elements of the boiler unit and then pass at through an ... to ..., which discharges the products through the chimney.

a) ash collector to an exhaust fan
b) electrostatic precipitator to the chimney
c) steam turbine to the chimney
d) economizer to the turbine

2) The basic elements of the nonnuclear thermal power plants are ...

a) a boiler unit and a steam turbine.
b) an economizer and an air heater
c) a separator drum and a steam turbine.
d) a boiler unit and an economizer

3) The feedwater at district heat and power plants is preheated by the …, whose temperature is only slightly above the temperature of the feedwater.

a) crumpled steam

b) spent steam

c) dry steam

d) warm steam

4) The air required for combustion, which is first heated by gases leaving the boiler unit in …, is fed to the combustion chamber by ….

a) a recuperative air heater; a forced-draft fan

b) a regenerative air heater; an exhaust air fan

c) an exhaust air fan; a recuperative air heater

d) a steam turbine; an exhaust air fan

5) Superheated steam passes from the superheater into…

a) a separator drum

b) a reheater

c) a steam turbine

d) the pipe

6) The steam, giving their energy in a turbine that turns …

a) the rotor

b) the nozzles

c) the intercooler

d) into electrical current

7) The … of the turbine's rotor is converted into … in the generator.

a) electric energy ; mechanical energy

b) mechanical energy ; thermal energy

c) mechanical energy; electric energy

d) radiation energy; electric energy

8) Spent steam from the turbine passes to ...

a) the deaerator

b) the condenser

c) the steam cleaner

d) the economizer

9) In the condenser temperature and pressure are …

a) change

b) constant

c) equal to ambient conditions

d) higher than ambient conditions

10) In a system of regenerative preheaters the condensate is heated by steam taken from…

a) the steam superheater

b) the turbine

c) the steam drum

d) the economizer

11) From the system of regenerative heaters hot condensate enters …

a) the condensate collector

b) the diffuser

c) the economizer

d) the heater

12) In coppers with natural circulation water from the economizer arrives in the…

a) the evaporator

b) distributing collector lower

c) the steam drum

d) the pipe

13) In once-through boilers water from the economizer arrives in …

a) the evaporator

b) distributing collector lower

c) the steam drum

d) the pipe

14) Steam-and-water mix arrives in … where there is steam and water ….

a) a drum; division

b) a drum; mixture

c) the screen steam superheater; heating

d) the place; equilibrium

15) In boiler pipes water partially … and steam-and-water mix comes back to the ...

a) evaporates; the drum

b) heat up; the turbine

c) evaporates; steam superheater

d) freezes; the pipe

16) To generate steam having supercritical parameters, … are used.

a) boilers with natural circulation

b) drum boilers

c) flow-through boilers

d) gyrotrons

17) Cooling water arrives in the … from system of reverse water supply called …

a) condenser; natural reservoir

b) condenser; cooling towers

c) condenser; pond cooler

d) boiler; water pump

18) In the gas-turbine engine fuel and air are fed into …

a) the combustion chamber

b) the burner

c) the furnace

d) the pipe

19) The high excess of air coefficient necessary … of the combustion products entering the gas turbine.

a) to lower the temperature

b) to increase the temperature

c) to stabilize the temperature

d) to increase the free energy

20) The combustion products give up part of their heat in …

a) the copper gas flue

b) the environment

c) a regenerative (recuperative) air heater

d) the furnace

21) In steam-gas turbine installations of the first type of steam from a high-pressure steam generator is directed into …; the combustion products enter …

a) the gas turbine; the steam turbine

b) the steam turbine; the gas turbine

c) the steam superheater; the flue

d) the air; the engine

22) In steam-gas turbine installations of the second type the hot exhaust gases from the gas-turbine enter the furnace of the steam boiler in order…

a) to increase the pressure

b) to reduce the temperature

c) to increase the temperature

d) to decrease the entropy

23) The hot exhaust gases serve to heat … in the boiler's economizer

a) the feedwater

b) the steam-gas mix

c) cooling water

d) liquid nitrogen

24) In diesel power plants, the electric generators are driven by ….

a) turbines

b) diesel generators

c) diesel engines

d) quark energy

25) Diesel power plants have big application in … power lines.

a) remote from

b) connection with

c) turbines of

d) nuclear

26. Diesel plants are used to supply electric power in regions …transmission lines.

a) close to

b) not far from

c) with mild climate
d) distant from

27. Steam-gas turbine installations have a … cycle involving both gas and steam turbines.
a) full
b) short
c) different
d) combined

28. Gas turbine engines have a very high power-to-weight …, compared to reciprocating engines;
a) parameter
b) division
c) ratio
d) factor

29. One of the advantages of gas turbine engines is a high operation ….
a) velocity
b) speed
c) capacity
d) conductance

30. Gas turbine engines are less responsive to changes in power … compared with reciprocating engines
a) demand b) supply c) pump d) rate

Специальность "Атомная энергетика"

1. Прочитайте тексты и ответьте на вопросы, выбрав вариант ответа "True" (правильно), "False" (неправильно), "Not stated" (не указано, т.е. на основании текста нельзя дать ни положительного, ни отрицательного ответа)

In Russia, a Push for Floating Nuclear Power Plants

By Ken Stier

Russians have always embraced the Arctic. Thriving communities dot the country's 4,300-mi (7,000 km) northern border, and the port town of Murmansk — home to 300,000 people — is the largest city north of the Arctic circle. America's closest competitor? Barrow, Alaska, which has some 4,000 souls.

Servicing these far-flung communities has never been easy. The job has been handled largely by Russia's fleet of nuclear-powered ice-breakers, hulking vessels that have the massive horsepower needed to ram sea ice up to two meters thick and bring in needed supplies. Keeping these towns heated and lit has been another challenge — one made harder after the collapse of Soviet-era energy and

transportation subsidies. Now however, the resourceful Russians have come up with an idea, one that they hope could not only secure the country's position as the preeminent Arctic power, but also blossom into a lucrative export business: floating nuclear power plants (FNPPs).

The idea of FNPPs is simple, if a little scary: Outfit a barge with two 35-megawatts reactors, float them to a spot off the coast and run cables to land to distribute your power. An FNPP set-up this size could power a city of 200,000.

The concept has some people screaming about "floating Chernobyls," but the technology is safer than that. For one thing, the portable reactors are fairly proven hardware, derived from those used on the icebreakers. And while any nuclear reactor poses real dangers if something goes wrong, the FNPPs are comparative pipsqueaks — their 35 MW output only a fraction of the Chernobyl plant's 4,000.

A prototype vessel has already been launched at a St. Petersburg shipyard; after reactors are affixed it will be towed to Vilyuchinsk, a city (pop. 25,000) in the Russian Far East that is home to a squadron of nuclear submarines. It is expected to be operational in 2012.

FNPPs could help Russia expand its reach in another critical way: powering the country's efforts to exploit its off-shore petroleum reserves, 90% of which lie in its Arctic continental shelf. Portable reactors would eliminate the cost and headache of transporting diesel long distances in harsh weather.

"The ultimate objective of the state policy is to transform the Arctic into 'Russia's foremost strategic base for natural resources' by 2020," notes a Norwegian Defense Institute study, citing Russian documents.

Western energy and mining firms are expected to be among the first customers for small reactors — and a number of western vendors, who see a growing global market, have begun developing their own systems. Shell considered one for its energy-intensive exploitation of tar sands in Alberta, Canada. Toshiba has already interested the remote Alaskan town of Galena (pop.700) in a 'pocket nuke' of 10 MW, to unshackle it from diesel-fired electricity that costs about 10 times the price paid in the lower 48.

So far though it is only Russia that is promoting water-based plants which, assurances aside, do present a host of new environmental, safety, liability and proliferation challenges. There is the difficulty of securing a perimeter and protecting against underwater vulnerability. Some critics worry the containment structures will be stripped down to fit on barges and that the auxiliary safety systems will not be as robust either.

Then there is the issue of where FNPPs might be deployed. Among a dozen or so countries reportedly interested is Indonesia, which is susceptible to tsunamis, not to mention terrorists who could hijack the vessel and steal radioactive material or simply blow the reactor up, possibly releasing a tremendous cloud of radioactive steam.

Russia's solution is the Build-Own-Operate model. Host countries would simply buy electricity (perhaps desalinated water too), leaving everything else to the Russians. There would be no transfer of material or technology and Russia would haul waste and spent fuel for reprocessing home every three to four years, and tow

the plant for maintenance every 12 years — three times in a plant's life span. "Historically, the Soviets and Russians have a dismal track record of nuclear waste management," says Thomas B. Cochran, a nuclear expert with the Natural Resources Defense Council. But Cochran thinks FNPPs may not pose "a particularly new concern, [but] more of the same" — at least in the Arctic, which is inhospitable to terrorists.
Russia seems determined to improve its reputation for safety, and has announced that it will keep the enrichment level of the fuel in its portable nukes to under 20%, below the weapons-grade threshold. But the Norwegian Radiation Protection Authority worries that Moscow might eventually be tempted to step up its enrichment level to improve profitability since its "main focus" is commercial. Russia's icebreakers were initially powered by 5% enriched fuel; its present, third-generation models run up to 90% — though in this case the motivation was efficiency, not money.
Still, since 1996, Russia has allowed the U.S., and later the U.K., Sweden and Norway to help patch up vulnerabilities in its icebreaker nuclear fuel cycle, which is a good sign of its seriousness. It's too early to tell if such cooperation would survive in a commercial sphere, especially one in which Russia has a rare lead in an intense global competition.

Agree, disagree or point out if not stated:

1. Murmansk is home to 300,000 people.
2. Murmansk is the largest city to the north of the Arctic Circle.
3. 2 reactors of 50 MW are being built at the PAES facility.
4. Portable reactors increase the cost of diesel transportation over long distances
5. The goal of the state policy is to transform the Arctic into an advanced Russian strategic base.
6. Western energy and mining companies have begun to develop their own nuclear power systems.
7. There is no difficulty in reducing underwater vulnerability of the system.
8. Indonesia is one of many countries interested in the construction of a floating NPP
9. The host countries are not just going to buy the electric power, but are also going to eliminate wastes and get rid of the spent fuel.
10. Russian icebreakers were originally designed for 15% of enriched fuel.

2. Вставьте вместо пропусков один из предложенных вариантов.

1. The nature of the binding energy of the nucleus is ...
a) not known
b) had not known
c) did not known
d) must have known
2. Atomic fission is the ... of heavy atoms (uranium)

a) split
b) splitted
c) splitting
d) merging

3. In a reactor, fission is controlled for the purpose of ... power or for research purposes.
a) produce
b) producing
c) produced
d) destruction

4. The quantity of energy lost ... the "binding energy" of the nucleus and equals the force which holds the protons and neutrons together in the nucleus.
a) calls
b) called
c) is called
d) has called

5. Neutrons ... and thus can neither repel nor attract other particles
a) have no charge
b) don`t have charge
c) hasn`t charge
d) charge

6. However the neutrons and protons of a nucleus are held tightly together, so the nuclear binding energy ... be stronger than the electrical repelling forces between the protons
a) must to
b) should to
c) has to
d) does not have to

7. The process of atomic fusion has been used so far only for war purposes, but from the very beginning Soviet scientists ... to achieve controlled thermonuclear reactions which could be used for peaceful purposes
a) tried
b) had tried
c) were trying
d) have not tried

8. Fission ... in the atomic bomb or in a nuclear reactor.
a) takes a place
b) take place
c) occurs
d) cannot occur

9. The station consisted of ... reactors, each capable of producing 1 GW of electric power.
a) three
b) four
c) six

d) zero
10. Specialists said that the requirements to the safety systems on an NPP ... change, because the safety... the priority.
a) will/were
b) would/was
c) will/is
d) has/was
11. Russia ... with several lead-cooled reactor designs, and has used lead-bismuth cooling for 40 years in reactors for its Alfa class submarines.
a) experimented
b) has experimented
c) experimenting
d) was not experimenting
12. In the decade from 1984 to 1994, scientists at Argonne National Laboratory … an advanced technology that … safe nuclear power unlimited by fuel supplies, with a waste product sharply reduced both in radioactive lifetime and amount
a) develop/promise
b) developed/promised
c) developed/promise
d) developed/eliminated
13. To control climate changes, we ... of virtually all carbon emissions from coal
a) have to get rid
b) must get reed
c) must to get rid
d) get reed
14. But the project was quashed by President Clinton in 1994 because Clinton said it was … and the scientists who worked on it were ordered to remain silent
a) unneeded
b) unaware
c) inneeded
d) inaware
15. And some really smart friends ... have read the stuff below, done their research, and their minds have changed as well
a) of me
b) of mine
c) of I
d) of your
16. If we don't get rid of coal plants all over the planet, ...
a) we would be completely hosed
b) we would have been completely hosed
c) we are completely hosed
d) nothing happens
17. If it isn't the single most important thing, ...
a) it would be awfully close to the top
b) it is awfully close to the top

c) it would have been awfully close to the top
d) it is the top
18. In fact, Hansen himself just … about the IFR recently.
a) find out
b) found out
c) finded out
d) funded out
19. ....., it's probably not well known.
a) If Hansen hadn`t known about it
b) If Hansen didn`t knew about it
c) If Hansen didn`t know about it
d) If Hansen don't knew about it
20.Scientific laboratories in the Soviet Union ... by a variety of methods upon these two problems of controlled fusion.
a) worked
b) have been working
c) was working
d) are worked
21.There is a certain success ... making the temperature needed for the fusion reaction.
a) at
b) in
c) of
d) onto
22.The studies of controlled fusion ... to a further development of a new subdivision of physics called "magnetohydrodynamics".
a) have led
b) led
c) had led
d) have lead
23.This binding energy is ... large.
a) absolutely
b) very
c) totally
d) not so
24.One of the ... ways to calculate it is by means of Einstein`s relation between mass and energy.
a) simplest
b) most simple
c) simpler
d) more simplest
25. It … great if he … help it succeed or has ideas on how to make it even better.
a) will be/could
b) would have been/could
c) would be/could

d) would/can

26. Control rods made of a neutron poison are used to … .

a) produce neutrons

b) split neutrons

c) absorb neutrons

d) heat water

27. The Chernobyl disaster was the worst nuclear power plant accident in history in terms of cost and casualties.

a) the worst

b) the bad

c) worse

d) a little

28. Most of today's nuclear plants are designed for … or …-year operating lives.

a) 10… 15

b) 30 … 40

c) 5 … 10

d) 20 … 30

29. In … reactors the water moderator functions also as primary coolant.

a) heavy water

b) light water

c) all types

d) foreign

30. The nuclear power industry … reactor technology for more than five decades and is starting to build the next generation of nuclear power reactors to fill new orders.

a) improved

b) has been developing and improving

c) will improve

d) was improving

Text 2.

Nuclear Fission and Fusion.

Once physicists had measured the precise masses of atomic particles, they found that the mass of an atom is less than the total of the masses of the electrons, protons and neutrons which compose the atom. Mass and energy are shown to he equivalent and one can be transformed into the other. The mass lost when an atom is formed from the nucleus of the atom and is transformed into energy which is released. The quantity of energy lost is called the "binding energy" of the nucleus and equals the force which holds the protons and neutrons together in the nucleus. The nature of the binding energy of the nucleus is not known, but it is not electrical energy, because the like electrical charges of the protons cause them to repel one another. Neutrons have no charge and thus can neither repel nor attract other particles. However the neutrons and protons of a nucleus are held tightly together, so the nuclear binding energy must be stronger than the electrical repelling forces

between the protons. Actually, it has been found to be more than 40 times as strong as electrical forces.

There are two methods by which some of the binding energy of the nucleus can be released to supply power: fission and fusion.

Atomic fission in the splitting of heavy atoms (uranium). Fission takes place in the atomic bomb or in a nuclear reactor.

In atomic bomb, fission is used for war purposes; in a reactor, fission is controlled for the purpose of producing power, for making radioisotopes or for research purposes. Atomic fusion is known ea thermonuclear reaction. Fusion takes place in the hydrogen bomb. The process of atomic fusion has been used so far only for war purposes, but from the very beginning Soviet scientists were trying to achieve controlled thermonuclear reactions which could be used for peaceful "purposes.

Soviet scientists were the first in the world to publish the results of their work in this field. In 1956, at the British Nuclear Research Centre at Harwell, Academician I.V. Kurchatov read a paper on the results of thermonuclear investigations conducted in the USSR and The possibilities of controlled thermonuclear reactions.

There are two main difficulties in controlling the fusion. One difficulty is the temperature at which the fusion takes place - the temperature of several hundred million degrees. The second difficulty is that during the fusion a dangerous gas is formed which must be contained in some manner. To make such a container is a very difficult problem. The temperature needed for the fusion processes lasts only a very small fraction of one millionth of a second. This is long enough for a bomb, but too short for a controlled reaction. But even if the scientists learned, how to get and control such temperature, the problem of making a container for the gas would still remain to be solved; there is no material out of which - the container could have been made. Any material known to scientists would become gas at a temperature a little over 6.000°C, while the temperature of fusion is several hundred million degrees

1. Agree or disagree (point if not stated):

1) Atomic mass can be less than the mass of electrons, protons and neutrons that make up the atom.

2) The energy of nucleus binding has electromagnetic nature.

3) When an atom is formed from the nucleus, the mass decreases.

4) Neutron cannot repel and attract other particles, because it has a charge.

5) In a nuclear bomb division is used for energy production.

6) Nuclear fusion is a thermonuclear reaction.

7) The process of nuclear fusion is used for military as well as peaceful purposes.

8) British scientists were the first to publish results in the field of thermonuclear fusion

9) Melting temperatures are enough to work in a bomb.

10) Any material known to scientists turns into gas at a temperature less than 6000 degrees.

2. Вставьте вместо пропусков один из предложенных вариантов.

1.To provide the power for a dynamo-electric machine, or electric generator, NPP

... the process of nuclear fission
a) rely to
b) rely for
c) rely on
d) rely in
2. In the vast majority of the world`s NPP, heat energy ... burning uranium fuel is collected in ordinary water and is carried away from the reactor`s core either as steam in boiling water reactors or as superheated water in pressurized-water reactors
a) generated by
b)generate by
c)generated of
d) generator
3.Boiling water and pressurized water reactors ... light water reactors
a)were called
b)are called
c)have been called
d) called
4. An assembly ... a group of sealed fuel rods
a) consists of
b) consist from
c)consist of
d) consists in
5. Uranium ore ... through conventional mining in open pit and underground methods similar to those used for mining other metals
a)could be extract
b) can be extracted
c)can be extract
d) extract
6. The back end of the cycle is divided ... the following steps
a) into
b) onto
c) in
d) if
7.The fuel ... at that time(spent fuel) is stored either at the reactor site
a)mischarged
b)discharged
c)less charged
d) not charged
8.If one-site pool storage capacity ..., it may be desirable to store age fuel in modular dry storage facilities known as ISFSI
a) is exceeded
b)had been exceeded
c)was exceeded
d) was lower

9.The spent fuel rods are ... stored in water
a)mostly
b)rarely
c)usually
d) sometimes
10.To protect the environment from residual ionizing radiation
a)from
b)of
c)against
d) after
11. If the natural disaster hadn`t taken place in Japan, Fukushima ... correctly
a)works
b) would work
c) would have worked
d) working
12. Secondly significant quantities of plutonium ... by the decommissioning of nuclear weapon.
a) have been release
b) had been release
c) have been released
d) release
13.Long-lived radioactive materials are produced by the operation of reactors of all types and, with the exception of the ... that have commercial applications, have to be treated as waste
a)few
b)little
c)a few
d) a little
14.Atomic fission in the splitting of ...atoms(uranium)
a)light
b)middle-sized
c)heavy
d) ultralight
15.... 1956, ... the British Nuclear Research Centre at Harwell, academician I.V.Kurchatov read a paper on the results of thermonuclear investigations
a) in/on
b)in/at
c)at/on
d) on/for
16. One difficulty is the temperatures at which the fusion takes place-the temperature ... several hundred million degrees.
a)of
b)in
c)at
d) onto

17.The second difficulty ... that during the fusion a dangerous gas is formed which must be contained in some manner
a)is
b)-
c)in
d) on
18.The temperature needed for the fusion processes lasts only a(an) ... small fraction of one millionth of a second
a)completely
b)absolutely
c) very
d) totally

19.If the scientists ... how to get and control such temperature, the problem of making a container for the gas ....
a) learnt/ would still remain to be solved
b)learnt/will still remain to be solved
c)had learnt/would still remain to be solved
d) learnt/will be solved
20.The heart,or core,of a reactor consists of ... number of cylinders packed with fissionable material, called "fuel rods".
a) a
b)-
c) an
d) the
21.There are two main motivations for using SRS models .... of RANS formulations
a)to favour
b) in favor
c)for favour
d) on favour
22. ... there is no unique model covering all industrial flows, and each individual model poses its own set of challenges
a) Nonfortunately
b) Unfortunately
c) imfortunately
d) immediately
23. In general, the user of a CFD code ... understand the intricacies of the SRS model formulation in order to be able to select the optimal model and to use it efficiently
a)must to
b)must
c)mustn`t
d) hasn't
24. 1 out of 5 households and businesses in the U.S. ... by nuclear energy

a) are electrically powering
b) is electrically powered
c) are electrically powered
d) are atomically powered

25.United States power plants ... 2000 metric tons of radioactive waste every year
a) produce
b) are producing
c) produces
d) waste

A nuclear reactor is a device to initiate and control a sustained nuclear chain reaction.
a) linear
b) permanent
c) sustained
d) critical

27. Most types of reactors are sensitive to a process variously known as … .
a) explosion
b) enrichment
c) xenon poisoning
d) diffusion

28. The neutron was discovered in … .
a) 1982
b) 1874
c) 1932
d) 1790

29. Early nuclear reactors did not use isotopically enriched uranium, and in consequence they were required to use … quantities of highly purified graphite as neutron moderation materials.
a) small
b) large
c) less
d) little

30. The high cost of nuclear technology means that … states have fielded nuclear submarines.
a) relatively few
b) nearly all
c) developing
d) no

Специальность "ОСС"

1. Прочитайте тексты и ответьте на вопросы, согласившись или не согласившись с предложенными утверждениями.

History of fiber optics.

The growth in use of fiber optics has truly been explosive. In the past fifteen years, it has become the medium of choice in telephony and data communications. It has also become the wiring medium of choice in high performance industrial applications.

Data networks came into being over 200 years ago in the fire storm of the French revolution and the Napoleonic Wars. These crude semaphore systems linked France from the Mediterranean Sea to the English Channel. They could transmit at 0.5 bits per second, which was nearly as fast as the electric telegraph, which came 50 years later. Today, commercial data networks run at over 2 billion bits per second. These networks require performance well beyond the capability of any electrical cable. They require optical fibers for reliable operation.

Until a few years ago, fiber optics was widely regarded as an esoteric and tricky technology that was limited to the telephone industry, or as an application-specific accessory that was furnished on custom-designed equipment. Today, however, plant engineers are finding fiber optics to be a practical medium for having error-free control communications in rigorous and demanding industrial applications. "The medium most recommended by vendors today for industrial networks is fiber optic cabling."

Optical fibers were originally developed by AT&T™ and Coming™ to replace microwave radio relay links for long distance telephone lines. Microwave radio signals travel in a straight line and are affected by heavy rain storms. The curvature of the earth resulted in relay stations being about 20 miles apart. Therefore, relay stations often needed to be in remote areas. The operating cost of building the tower, antennas, amplifiers, buildings, etc., and maintaining them was substantial.

Early efforts at developing practical applications for fiber optics were directed toward telecommunications. That glass fiber could be used in telecommunications applications was first predicted in 1966. The first operating glass fiber was reported in 1969. It was recognized that fiber optic cable would be feasible for telecommunications transmission only if glass could be developed so pure that at least 1% of the light would remain after traveling one kilometer. This level was obtained by researchers at Coming Glass Works in 1970. The first technical feasibility field trial was reported in 1976. In the next few years, fiber attenuation (signal loss) dropped by nearly one hundred times. In today's best optical fibers, 10% of the light remains after traveling through more than 60 kilometers (almost 40 miles) of fiber.

By 1980, optical fibers had improved to the point that repeaters could be twice as far apart as microwave radio relay stations. Even with the need to own the right of way for the fiber, the operating cost of a long distance telephone circuit on fiber was less than half that of a telephone circuit on microwave radio links. At about this same time, the long distance telephone network in the United States was deregulated and opened up to competition. MCI™ and Sprint™ installed fiber networks and were at a cost advantage over AT&T, which had mostly microwave networks installed. The advantage of fiber optics in telephony has been so

substantial that over 10 million kilometers of fiber have been installed worldwide. If all this fiber were stretched end to end, it would circle the globe 400 times. Furthermore, fiber installation is expected to grow at 23% yearly over the next five years.
However, in industrial networks the advantages of fiber are not the same as in telephony networks. Distances are usually measured in hundreds of feet rather than dozens of miles. Rather than long distances and large bandwidth (information carrying capacity), industrial applications use fiber optics because of its noise immunity. Widespread installation of fiber optics in industrial applications began in 1984, with over 500 industrial systems in operation today. Until recently, most of the information on fiber optics was published in high tech journals. Today, fiber optic information appears in publications that are commonly used by plant engineers.

Agree or disagree:

1. MCI™ and Sprint™ were at a cost advantage over AT&T.
2. Industrial applications use fiber optics mainly because of large bandwidth.
3. Today best optical fibers, more than 10% of the light remains after traveling through more than 60 kilometers of fiber.
4. Data networks came into being in the fire storm of the revolution and the wars.
5. Fiber optic cable would be feasible for telecommunications transmission only if glass could be very pure.
6. The first data networks could transmit at 2 billion bits per second.
7. Fiber optic information appears in publications that are commonly used by plant engineers.
8. Usage of glass fibers in telecommunication applications was first predicted in 1966.
9. Most of today's information on fiber optics is published in high tech journals
10. Fiber optics is generally very sensitive to noise

Test1

2. Выберите подходящий вариант ответа.

1. Optical fiber … in the 70's of last century and was originally used primarily for data transmission over long distances at high speed.

a) invented b) was invented c) has been invented d) had been invented

2. The basis for an optical-fiber temperature measurement … the callback method of Raman scattering.

a) has been taken b) had been taken c) is taken d) will be taken

3.The minimum achievable attenuation of glass fibers is limited...the emitted light scattering caused ... the amorphous structure of glass fibers.

a) to, at b) to, by c) at, by d) at, to

4. When light acts ... these molecular vibrations, the light particles (photons) interact with electrons of the molecules.

a) in b) at c) into d) on

5. In the optical fiber ... light, consisting of several spectral components: Rayleigh scattering, Raman and Brillion scattering.

a) is scattered b) is being scattered c) has been scattered d) had been scattered

6. With the help of block signal (Raman OTDR) temperatures in the glass fiber in the light guide cable ... defined for specific points.

a) must be b) can be c) may be d) could be

7. Under the fiber-optic temperature measurement to understand the application of optoelectronic devices for measuring the temperature at which glass fibers ... as linear sensors.

a) use b) were used c) have been used d) are used

8. The shell as a reflective layer helps keep the light signal ... the core.

a) on b) into c) inside d) in

9. Optical fibers ... of doped silica glass, which consists of silicon dioxide (SiO2) with an amorphous solid structure.

a) make b) made c) are made d) were made

10.Unpigmented human hairs ... also ... to act as an optical fiber.

a) have been shown b) have shown c) had been showen d) had showen

11. Image transmission through tubes ... independently by the radio experimenter Clarence Hansell and the television pioneer John Logie Baird in the 1920s.

a) demonstrated b) was demonstrated c) were demonstrated d) had demonstrated

12. Modern optical fibers, where the glass fiber ... with a transparent cladding to offer a more suitable refractive index, appeared later in the decade.

a) coated b) was coated c) is coated d) has been coated

13. Harold Hopkins and Narinder Singh Kapany at Imperial College in London achieved low-loss light transmission through a 75 cm long bundle which combined ... thousand fibers.

a) several b) some c) a few d) any

14. Their article titled "A flexible fibrescope, using static scanning" ... in the journal Nature in 1954.

a) was being published b) was published c) published d) had been published

15. In the process of developing the gastroscope, Curtiss produced the first glass-clad fibers; previous optical fibers ... on air or impractical oils and waxes as the low-index cladding material.

a) relied b) had been relied c) had relied d) were relied

16. NASA used fiber optics in the television cameras that ... to the moon.

a) sent b) were sent c) had sent d) were being sent

17. At the time, the use in the cameras was classified confidential, and only those with sufficient security clearance or those accompanied ... someone with the right security clearance were permitted to handle the cameras.

a) to b) with c) by d) –

18. The per-channel light signals propagating in the fiber … at rates as high as 111 gigabits per second (Gbit/s) by NTT, although 10 or 40 Gbit/s is typical in deployed systems

a) had been modulated b) modulated c) have been modulated d) have modulated

19. The optical fiber is electrically non-conductive, so it … as an antenna to pick up electromagnetic signals.

a) does not act b) did not act c) has not acted d) won't act

20. Information traveling … the optical fiber is immune to electromagnetic interference, even electromagnetic pulses generated by nuclear devices.

a) into b) inside c) in d) to

21. Attenuation loss can be as low as 0.2 dB/km in optical fiber cables, allowing transmission over long distances … the need for repeaters.

a) outside b) out of c) for d) without

22. Light travels fastest … a vacuum, such as … outer space.

a) in, in b) into, in b) inside, in d) in, inside

23. Light travels … the fiber core, bouncing back and forth off the boundary between the core and cladding.

a) to b) through c)at d) in

24.… special-purpose optical fiber is constructed with a non-cylindrical core and/or cladding layer, usually with an elliptical or rectangular cross-section.

a) any b) a few c) several d) some

25. Photonic-crystal fiber … with a regular pattern of index variation (often in the form of cylindrical holes that run along the length of the fiber).

a) made b) is made c) is being made d) had made

26. The propagation of light through the core of an optical fiber is based … total internal reflection of the lightwave.

a) in b) at c) on d) to

27. Optical fibers … to terminal equipment by optical fiber connectors.

a) connected b) are connected c) have connected d) connect

28. These connectors are usually of a standard type such as FC, SC, ST, LC, MTRJ, or SMA, which is designated …higher power transmission.

a) for b) to c) – d) at

29. The mating mechanism … push and click, turn and latch (bayonet mount), or screw-in (threaded).

a) may be b) can be c) must be d) is able to

30. Some of the most popular connectors are pre-polished …the factory, and include a gel inside the connector.

a) on b) at c) in d) to

Test 2

1. Typical fiber construction ….. three coaxial parts: core, cladding, and coating.
   a) included b) includes c) including d) was included
2. Surrounding the core is the cladding, which has a …. refractive index.
   a) lower b) higher c) same d) zero
3. Total internal reflection determines the ….. at which light rays can enter a fiber core.
   a) maximum angle b) minimum angle c) optimum angle d) average angle
4. The ….. the light rays are absorbed or scattered, the ….. the intensity of the optical signal.

a) more, stronger b) less, weaker c) more, weaker d) less, stronger

5. The velocity of the light in a material is equal to the velocity of light in ..... divided by the index of refraction of the material.
   a) water b) air c) vacuum d) gasoline
6. Willebrord Snell discovered that there was a relationship between the refractive indices of the materials and the ..... of the angles.
   a) sine b) cosine c) tangent d) secant
7. If the fiber has parallel sides, and is surrounded by a material with a ..... refractive index, the light will be reflected along it at a constant angle.
   a) lower b) higher c) same d) zero
8. The ..... confines the light to the core, similar to the manner in which insulation confines electricity to the conductor in an insulated wire.
   a) core b) cladding c) coating d) grating
9. The core and cladding assembly is covered with a protective polymer ..... to provide mechanical strength and water resistance.
   a) core b) cladding c) coating d) grating
10. A ..... numerical aperture also means that the fiber guides the light ..... .
    a) large, poorly b) large, strongly c) small, strongly d) small, poorly

11. When the core of the fiber is ..... enough that only one ray can pass down the axis of the core, it is called single-mode fiber.

    a)small b) large c) transparent d) fragile

12. Multimode fiber is used ..... medium speed, medium distance applications.

    a) of b) with c) for d) onto

13..... is the decrease in power of an optical signal from input to output.

    a) attenuation b) interference c) utility d) diffraction

One fundamental attenuation process for glass is due to the inherent fluctuations in the structures and is called Rayleigh ..... .

    a) scattering b) reflection c) absorption d) heating

14. Plastic fiber has attenuation that is 100-1,000 times ..... than glass at the wavelengths of common light sources.

    a) greater b) large c) more d) less

15. In fiber-optic communications, wavelength-division multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals onto a single optical fiber by using different ..... of laser light.

    a) speeds b) wavelengths c) index of refractions d) mass

16. An electro-optic effect is a change in the optical properties of a material in response to an ..... that varies slowly compared with the frequency of light.

    a) water b) temperature change c) electric field d) magnetic field

17. An optical communications repeater is used to ..... an optical signal.

a) reflect b) regenerate c) suppress d) excite

18. At the receiving end of the data link ..... is normally required to break single data stream back down into the original streams.

a)demultiplexer b) multiplexer c) repeater d) converter

19. Electrical-to-optical and optical-to-electrical converter is called a ..... .

a)demultiplexer b) multiplexer c) modem d) generator

20. Because the signal conductor is ..... , conductor and connector integrity cannot be ruined by corrosion.

a) gas b) glass c) metal d) water

21. Optical fiber ..... total electrical isolation between the attached devices.

a) not provides b) provides c) transmits d) eliminates

22. Fiber-optic communication is a method of transmitting ..... from one place to another by sending pulses of light through an optical fiber.

a) matters b) information c) substances d) fields

23. The most commonly used optical transmitters are semiconductor devices such as light-emitting ..... and laser..... .

a) resistors, diodes b) diodes, diodes c) transistors, diodes d) triodes, diodes

24. The main ..... of an optical receiver is a photodetector, which converts light into electricity using the photoelectric effect

a)selection b) medium c) component d) gas

25. The 'dispersion compensator' sharpens the pulse so that it can be correctly ..... by the electronics.

a) decodes b) decoding c) decoded d) encoded

26. Thousands of electrical links ..... to replace a single high bandwidth fiber cable.

a) would be required b) would be requiring c)required d) do required

27. Rough and irregular surfaces, even at the molecular level, can cause light rays to be reflected in ... directions.

a) certain b) random d) left d) right

28. Light scattering depends on the ... of the light being scattered.

a) wavelength b) mass c) force d) form

29. Glass optical fibers are almost always ... silica, but some other materials

a) made with b) made from c) thicker than d) a part of

30. Silica fiber also exhibits a high ... for optical damage.

a) fragile b) power c) threshold d) mass

3. Согласитесь или не согласитесь с предложенными утверждениями.

True, false or not stated.

1. Optical fibers are widely used in fiber-optic communications.
2. Fibers are used instead of metal wires because signals travel along them with less loss and are also immune to electromagnetic interference.
3. Optical fibers typically include a metal core
4. Light is kept in the polymeric layer by total internal reflection.
5. Single-mode fibers are used for most communication links longer than 1,000 meters (3,300 ft).
6. Joining lengths of optical fiber is a simple than joining electrical wire or cable.
7. Fibers are flexible and can be bundled as cables.
8. Each fiber can carry many independent channels, each using a different wavelength of light.
9. Light transmission through optical fibers depends on other electromagnetic radiation nearby.
10. Optical fibers do not conduct electricity, preventing problems with ground loops and conduction of lightning.

Институт ИРИТ

Специальности ИТС, ИВТ, ПМ

Задание 1. Прочитайте текст и ответьте на вопросы.

Текст № 1

History of the Telephone Industry

For years Graham Bell (as he liked to be called) had been experimenting with a "harmonic telegraph". It should be possible, he reasoned, to send six tones over the same wire at the same time and cause six reeds attached to the receiving end to be operated. Furthermore, if all worked well, varied combinations of these six pitches could reproduce human speech.

On July 9, 1877, the Bell Telephone Company was formed, and Alexander Graham Bell became the company's «electrician» at a salary of $3,000. Unfortunately for Bell, the basic patents were due to run out in 1893 and 1894. The expiration of Bell's basic patents in 1893 and 1894 was the starting signal for open competition.

By 1934 telecommunications had become so important to the country that Congress passed a Communications Act and, simultaneously, created the Federal Communications Commission (FCC). The section of this Act that has turned out to be most important has to do with what we now call universal service.

In November, 1974, the Justice Department filed suit to break up the Bell System. The case trudged on until 1978, when Judge Harold Greene took over. He moved things quickly, and on January 4, 1982, a terse announcement was issued by the Justice Department and AT&T saying that negotiations had been reopened. Then, on January 8, 1982, AT&T had agreed to break up its $136.8 billion empire. It would keep its manufacturing facilities, and its long-distance network. The agreement would take effect on January 1, 1984.

That remained the state of affairs until the passage of the 1996 Telecommunications Act. This Act threw most of the rules established in 1984 out the window and left the implementation of the Act to the FCC.

Для каждого утверждения выберите вариант ответа "True" (верно) или "False" (неверно).

1. Alexander Graham Bell called his first telephone a “synchronous telegraph”.
2. The expiration of Bell's basic patents in 1893 and 1894 was the starting signal for open competition.
3. In 1946, Congress passed a Communications Act and established the Federal Communications Commission.
4. The Justice Department file suit to break up the Bell System in 1974.
5. The Telecommunications Act was passed in 1996.

Текст № 2

Types of Networks

If there were only three or four telephones in a locale, it would make sense to connect each phone to all other phones and find a simple method of selecting the desired one. However, if there are three or four thousand phones in a locale, such a method is out of the question. Then it is appropriate to connect each phone to some centrally located office and perform switching there. As we connect each of these thousands of telephones to the central office, we have what is a star configuration; all lines are particular to one and only one station, and all terminate on the nucleus of this star - the central office (CO).

These connections are called the local exchange plant, and the telephone company handling this function is called the local exchange carrier (LEC). The

connections themselves are often called the «local loop»; at other times we refer to them as «the last mile». In more technical terms, the section closest to the customer's premises is called the distribution plant and that section closest to the central office, the feeder plant.

But what if a particular telephone call is not originated and terminated within the particular central office's geographic coverage? The answer, of course, is to connect these central offices to a higher echelon central office. Local office, also called the end office, is called a Class 5 office. The office to which it connects is called the Class 4 office and so on, with the top level, the Class 1 office. The only office that has people as its subscribers is the Class 5 office. Those lines connecting switching offices to switching offices, rather than to subscribers, are called trunks.

But this hierarchical network is not the only network in the telephone system of today. There are many others, for example:

- A local area network (LAN) is a limited distance network connecting a defined set of terminals. It could connect workstations in an office, offices in a building, or buildings on a campus.
- A wide area network (WAN) links metropolitan or local networks usually over common carrier facilities.
- The synchronous optical network (SONET) is a particular set of standards that allows the interworking of products from different vendors. It usually embodies a fiber-optic ring that will permit transmission in both directions.
- The Internet is really quite different from the network we have been describing. It is a packet network (rather than a circuit-switched network).

Выберите правильный вариант ответа:

1. Each telephone subscriber is connected to several central offices (COs).
    a. true
    b. false

2. The local loop, or the connections between individual subscribers and central offices, is also known as the last mile.
    a. true
    b. false

3. The _____ is a particular set of standards that allows the interworking of

products from different vendors. It usually embodies a fiber-optic ring that will permit transmission in both directions.

a. local-area network (LAN)
b. wide-area network (WAN)
c. synchronous optical network (SONET)
d. common channel signaling network

4. The only class central office that has people as its subscribers is a _____ office.

a. Class 1
b. Class 2
c. Class 4
d. Class 5

5. The central office and the telephones connected to it form a _____ network configuration.

a. star
b. tree
c. circle
d. chain

Текст № 3
Switching Systems

In the late 1800s, telephone calls were connected manually at the central office (CO). When a call came in, an attendant would plug into a horizontal bar line. He then would yell to the operator who handled the customer being called, and that second operator would connect to the bar and finish setting up the call. When the call was completed, another operator would yell to all in the room that the line was clear again.

When electronics came along, the electromechanical control of the common control system was replaced with electronics, and the network, or matrix, was usually replaced with tiny glass-encapsulated reed switches. Hence only a part of the switch was electronic. In the next generation, the stored program operation of a digital computer was applied to the switch, although the network remained a complex of reed switches. In the final generation, called a digital switch, the talking path was no longer an electrically continuous circuit; rather the speech

being carried was digitized into a stream of ones and zeros.

However, whether the system was analog or digital, one thing must be recognized: there was an actual talking path—a circuit—from the calling party to the called party. This talking path was established at the beginning of a call and held for the duration of a call. We call it circuit switching.

There is, however, a different kind of connection, and we see it today in a number of applications:

- credit-card verification
- SS7
- Internet and the World Wide Web

This system is called packet switching (as opposed to circuit switching). In a packet switching system, the information being transmitted (be it data or digitized voice) is not sent in real time over a dedicated circuit; rather it is stored in a nearby computer until a sufficiently sized packet is on hand. Then a very smart computer seizes a channel heading in the general direction of the destination, and that packet of data is transmitted at very high speeds. Then the channel is released. When the distant station gets that message no more than a few milliseconds later, it responds with the necessary handshaking information - again, by accumulating a packet of data, seizing a channel, and bursting the information out over that channel.

As mentioned earlier, the packet networks in the world are being used extensively for data; only recently are we seeing them being used for voice. As systems are perfected, this also will change.

Выберите правильный вариант ответа:

1. Packet switching is used for which of the following?
    a. credit-card verification
    b. SS7
    c. the Internet and the World Wide Web
    d. all of the above

2. The final generation of the switching systems uses a _____ switch.
    a. mechanical
    b. electromechanical
    c. digital
    d. analog

3. Data packet transmission in the modern packet-switching networks takes _____.

a. milliseconds
b. seconds
c. minutes
d. hours

4. What is the switching technology used in the telephone networks called?

a. packet switching
b. circuit switching
c. data switching
d. frequency switching

5. What are the main types of information transmitted in the packet networks?

a. data and voice
b. voice and video
c. video and music
d. data and video

Текст № 4
Transmission Media

There are four types of media that can be used in transmitting information in the telecommunications world: 1) copper wire; 2) coaxial cable; 3) fiber; wireless.

In days of old, copper wire was the only means of transmitting information. Technically known as unshielded twisted pair (UTP), this consisted of a large number of pairs of copper wire of varying size in a cable. The cable did not have a shield and therefore the signal—primarily the high-frequency part of the signal—was able to «leakout». However, this is the way it was done, and for voice communications it was quite satisfactory.

Coaxial cable consists of a single strand of copper running down the axis of the cable. This strand is separated from the outer shielding by an insulator made of foam or other dielectrics. Covering the cable is a conductive shield. Usually an outer insulating cover is applied to the overall cable. Because of the construction of the cable, obviously «coaxial» in nature, very high frequencies can be carried without leaking out. In fact, dozens of TV channels, each 6 MHz wide, can be carried on a single cable.

Fiber is the third transmission media, and it is unquestionably the

transmission medium of choice. Whereas transmission over copper utilizes frequencies in the megahertz range, transmission over fiber utilizes frequencies a million times higher. This is another way of saying that the predominant difference between electromagnetic waves and light waves is the frequency. Transmission speeds of as high as 9.9 Gbps have become commonplace in the industry today. At this speed the entire fifteen-volume set of Encyclopedia Britannica can be transmitted in well under one second.

Laying fiber, on a per-mile basis, still costs more than laying copper. However, on a per-circuit basis there is no contest; fiber wins hands down. However, if a local loop is being laid to a residence, there is little justification to installing fiber - there will never be a need for more than one or two or three circuits. The message is clear: apply fiber when it is economical to do so, otherwise rely on copper.

Fiber comes in several forms: the two predominant ones are multimode and single-mode. The total strand diameter for both is about 125 microns (a micron is a millionth of a meter). However, the ultrapure glass that forms the core transmission medium is between 50 and 62.5 microns for the multimode fiber and about 8-10 microns for the single mode fiber. One would think that the multimode fiber would have a greater carrying capacity; however, just the opposite is true. In fact, single-mode fiber makes up the majority of today's long-distance network.

The tremendous capacity of fiber certainly makes for more efficient communications; however, placing so much traffic on a single strand makes for greater vulnerability. Most of the disruptions in the long-distance network are a result of physical interruption of a fiber run.

Wireless communications is the final option as a transmission medium. This can take several forms: microwave, synchronous satellites, low-earth-orbit satellites, cellular, personal communications service (PCS), etc. In every case, however, a wireless system obviates the need for a complex wired infrastructure. In the case of synchronous satellites, transmission can take place across oceans or deserts. With microwave there is no need to plant cable, and in mountainous territories this is a significant advantage. Cellular and PCS afford mobility. There are advantages and disadvantages to each.

Выберите правильный вариант ответа:

1. The types of media that can transmit information in the telecommunications world are mentioned in the text?
    a. copper wire, coaxial cable, fiber, and wireless
    b. hybrid fiber/coax and copper wire
    c. wireless and copper wire