No. of Questions : 200   Time Allowed : 2 hours

REASONING ABILITY

Directions (Q. 1-4) : Study the following information carefully and answer the questions given below.

(i) There is a group of five persons M, N, O, P and Q of a family. They are businessman, farmer, lawyer, doctor and teacher.

(ii) N is an unmarried teacher, who is M's daughter.

(iii) Q is an lawyer, who is O's brother.

(iv) O in this family is the only husband of a married couple.

(v) M is a farmer, who is father of two sons and an unmarried daughter.

(vi) M's daughter-in-law is a doctor.

1. Who is doctor in this family ?
   (a) N   (b) P
   (c) O   (d) Q

2. Who is businessman in this family ?
   (a) M   (b) N
   (c) O   (d) P

3. Which of the following is a group of women in this family ?
   (a) M, N and Q   (b) N and O
   (c) P and Q   (d) N and P

4. Which of the following is a married couple ?
   (a) M and P   (b) M and N
   (c) N and P   (d) O and P

Directions (Q. 5-6) : Study the following information carefully and answer the questions given below.

(i) A marketing-execuitve plans to visit each of six compainies J, K, L, M, N and O exactly once during the course of one day.

(ii) He must visit J before K and N.

(iii) He must visit K before M.

(iv) The third company he visits must be L.

5. If the marketing-executive vistis O first, which company must he visit second ?
   (a) J   (b) K
   (c) L   (d) M

6. Which of the following could be the order in which the marketing-executive visits the six companies?
   (a) J, O, L, K, N, M   (b) M, K, L, N, O, J
   (c) J, N, K, M, L, O   (d) L, O, J, N, M, K

7. A is the son of B while B and C are sisters to one another, E is the mother of C. If D is the son of E, which of the following statements is correct?
   (a) E is the brother of B
   (b) D is the cousin of A
   (c) B and D are sisters
   (d) D is the maternal uncle of A

8. Sandip walks 20 metres towards North. Then, he turns right and walks 30 metres. Now, he turns right and walks 35 metres. Now, turning left, he walks 15 metres. Again he turns left and moves 15 metres. In which direction and how far is he from his original position ?
   (a) 15 m East   (b) 45 m East
   (c) 15 m West   (d) 45 m West

Directions (Q. 9-12) : Study the following information carefully and answer the questions given below.

Following are the criteria for selection in the National Hockey Men's Team. The candidate must

(i) be doing graduation.

(ii) have participated in school hockey team.

(iii) have the minimum height of 5'6''.

(iv) have the minimum weight of 54 kg.

However, if a player fulfills all other criteria EXCEPT

(v) (ii) above, but he must have represented his district.

(vi) (iii) and (iv) above, but he must be a state-level player.

(vii) if player is the son of a famous player and does not fulfill the criteria (iii) or (iv) in this situation, his case will be referred to Government.

(viii) (i) above, but fulfills all criteria then his case will be referred to the Chairman of selection committee.

(ix) If any player has not given full details; then he will be asked for the details.

Based on the above criteria and information provided against each candidate/player take a decision in each case. You are not to assume anything. If the data given are not adequate to take a decision mark your answer "Data inadequate".

Give answer

(a) If the player is to be selected.

(b) If the player is not to be selected.

(c) If the player will be asked for more details.

(d) If his case will be referred to the Chairman.

9. Satish is weighing 55 kg and 5'8" tall. He is a member of state hockey team.

10. Abhinav is the son of famous hockey player. He is doing his B.A. from Patna College, Patna. He is 5'7" tall and weight 64 kg; He is captain of district hockey team.

11. Prathmesh, a Xth class student is a member of district hockey team. He is 5'8" tall and weighing 59 kg.

12. Ajay is a student of degree college. He was member of school hockey team. He is 5'10" tall and 53 kg.

Directions (Q. 13-16) : Study the following letter-number-symbol sequence carefully and answer the questions given below :

G 6 * V 5 A @ 3 B K Q 4 Δ I Z 2 M O β 7 C Y U 1 D R

13. Which of the following will be midway between the sixth element from your left and 13th element from your right in the above sequence ?
    (a) M   (b) K
    (c) @   (d) Q

14. Which of the following will be fifth element to the left of 14th element from your left in the series?
    (a) A   (b) C
    (c) K   (d) B

15. If the second half of the series is written in reverse order which of the following will be 8th element to the right of sixth element from your left ?
    (a) D   (b) I
    (c) R   (d) Z

16. What should come in the place of question mark in the following series ?
    G * V, 6 V A, ?, V34, 5KZ
    (a) *AB   (b) VA3
    (c) @BQ   (d) 412

17. If the first four letters of word "ANTHRO-POMORPHISM" are written in reverse order, again next four letters are written in reverse order and if this order is continued, after change which will be 12th letter in the new sequence ?
    (a) P   (b) H
    (c) M   (d) O

18. Five boys are sitting in a circle. Ajay is between Ramesh and Damanik. Suleman is left to Vikas. Ramesh is left to Suleman. Who is sitting immediate right to Ajay ?
    (a) Suleman   (b) Damanik
    (c) Vikas   (d) Ramesh

19. In a certain code language PUBLIC is written as MWYNEFE. How will SYSTEM be writen in that code languate?
    (a) NANVCO   (b) OBOVCP
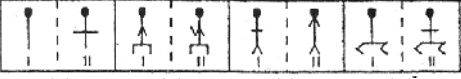   (c) PAPVCO   (d) MAMVCO

20. If by following certain rearrangement code "Can Pleasure Great Careful Lay Itinerary A Planning For Out" gets decoded as "Careful Planning Can Lay Out A Great Itinerary For Pleasure" then how will "Would Difficulties There Life Be Were If Indeed No Dull" be decoded ?
    (a) There Would Be No Difficulties If Were Life Dull Indeed.
    (b) There Would Be No Difficulites If Life Were Dull Indeed.
    (c) Life Indeed Would Be Dull If there Were No Difficulties.
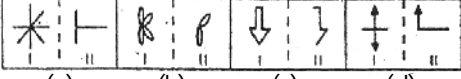   (d) Life Indeed Would Be Dull If Were There No Difficulties.

Directions (Q. 21-24) : Each of the following questions is based on code language which utilises letters of the English alphabet. In each question there is a word written in capital letter; with one letter printed in bold. For each letter in that Word there is a code written in small letters. That code is denoted by either (a), (b), (c) or (d) but not in the same order. You have to find out the exact code for the bold letter in the word. The number of that code is the answer. Please note that the same letter appearing in other words may be coded differently.

21. T I N Y
    (a) p   (b) e
    (c) j   (d) u

22. B L A C K
    (a) f   (b) e
    (c) p   (d) g

23. R O U G H
    (a) m p   (b) p s
    (c) s v   (d) e h

24. M E A L
    (a) n   (b) q
    (c) e   (d) g

25. In a certain code language JOGGLE is coded as LQIEJC. How will LESSON be coded in that code language ?
    (a) MGUQML   (b) MGQUML
    (c) NGQUML   (d) NGUQML

Directions (26-30) : In each of the following questions in four of the five figures, element I is related to element II in the same particular way. Find out the figure in which the element I is not so related to element II.
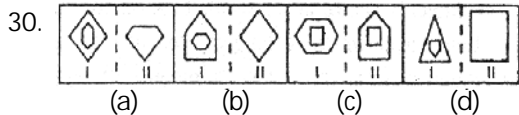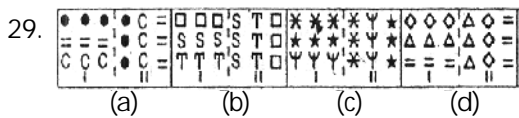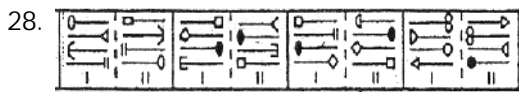
26.
    (a)   (b)   (c)   (d)

27.
    (a)   (b)   (c)   (d)

28.
    (a)   (b)   (c)   (d)

29.
    (a)   (b)   (c)   (d)

30.
    (a)   (b)   (c)   (d)

Directions (31-35) : In each of the following questions a series begins with unnumbered figure on the extreme left. One and only one of the five numbered figures in the series does not fit into the series. The two unnumbered figures one each on the extreme left and the extreme right fit into the series. you have to take as many aspects into account as possible of the figures in the series and find out the one and only one of the five numbered figures which does not fit into the series. The number of that figure is the answer.

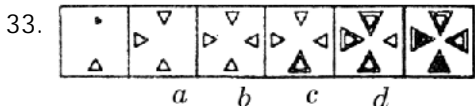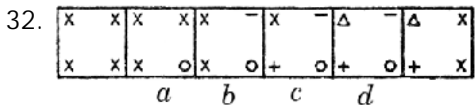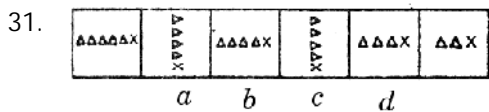31.
        a   b   c   d

32.
        a   b   c   d

33.
        a   b   c   d

34.
        a   b   c   d

35.
        a   b   c   d
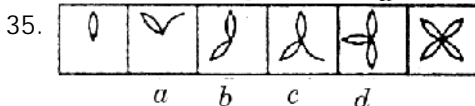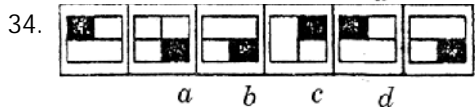
Directions (Q. 36-40) : In the following questions the symbols *, Δ, □, ⊕, and + are used with the following meaning.

M * N means M is greater than N.

M □ N means M is either greater than or equal to N.

M Δ N means M is equal to N.

M ⊕ N means M is smaller than N.

M + N means M is either smaller than or equal to N.

Now in each of the following questions assuming the given statements to be true find which of the two conclusions I and II given below them is / are definitely true?

(a) if only conclusion I is true.

(b) if only conclusion II is true.

(c) if both conclusions I and II are true.

(d) if neither conclusion I nor II is true.

36. Statements.
    A * B, B □ C, B ⊕ D
    Conclusions.
    I. A □ C
    II. D * B

37. Statements.
    S + T, S □ U, U Δ W
    Conclusions.
    I. T * U Δ W
    II. S + W * U

38. Statements.
    J * K, K * L, M + N
    Conclusions.
    I. J * L
    II. N □ L ⊕ J

39. Statements.
    A Δ B, D ⊕ E, E + F
    Conclusions
    I. E * B
    II. B ⊕ E + F

40. Statements.
    Z * P, P * L, L * K, K * M
    Conclusions.
    I. M ⊕ L ⊕ Z
    II. M ⊕ K ⊕ Z

Directions (Q. 41-45) : Study the following arrangement carefully to answer these questions.

4 D # Q H I 3 L @ R E 6 1 M % F A 7 J P U B 5 8 $ K 9 ©

41. How many such symbols are there in the above arrangement each of which is immediately preceded and also immediately followed by a consonant?
    (a) None   (b) One
    (c) Two   (d) Three

42. Which element is third to the right of fifteenth from the right end?
    (a) 1   (b) M
    (c) 6   (d) None of these

43. If all the symbols are dropped from the given arrangement, which element will be ninth from the right end?
    (a) A   (b) 7
    (c) J   (d) E

44. How many such numbers are there in the given arrangement each of which is immediately preceded by a vowel?
    (a) None   (b) One
    (c) Two   (d) Three

45. Four of the following five are alike in a certain way based on their positions in the given arrangement and so form a group. Which is the one that does not belong to the group?
(a) L@3   (b) I3H
(c) A7F   (d) $8K

Directions (Q. 46-50) : These questions are based on the following set of numbers.

385   496   239   891   752

46. If in each number the positions of first and the third digits are interchanged and then the numbers are arranged in descending order which number will be second?
(a) 385   (b) 496
(c) 239   (d) 891

47. If all the numbers are arranged in descending order, what is the second digit of the fourth number?
(a) 9   (b) 3
(c) 5   (d) 8

48. What is the sum of the middle digit of the smallest number and the first digit of the largest number?
(a) 4   (b) 12
(c) 11   (d) 5

49. What is the difference between the third digit of the smallest and the largest numbers?
(a) 8
(b) 6
(c) 5
(d) 4

50. If in each number the first and second digits are interchanged and then the numbers are arranged in descending order, which number will be the first?
(a) 385
(b) 496
(c) 239
(d) 891

ENGLISH LANGUAGE

Directions (Q. 51-55) : Rearrange the following six sentences A, B, C, D, E and F in the proper sequence so as to form a meanfingful paragraph, then answer the questions given below them.

A. Suddenly the dog saw a wolf entering the house.

B. He became alert and finally killed the wolf.

C. The dog was sleeping beside the child guarding him against any danger.

D. One day he and his wife went to the market leaving behind their child who was sleeping.

E. He used to leave the dog as a guard whenever he went out.

F. There was a hunter who has a faithful dog.

51. Which of the following will be the FIFTH sentence after rearrangement ?
(a) F   (b) E
(c) B   (d) A

52. Which of the following will be the SECOND sentence after rearrangement?
(a) A   (b) B
(c) C   (d) E

53. Which of the following will be the THIRD sentence after rearrangement ?
(a) A   (b) B
(c) D   (d) C

54. Which of the following will be the SIXTH sentence after rearrangement ?
(a) A
(b) B
(c) C
(d) D

55. Which of the following will be the FIRST sentence after rearrangement ?
(a) F   (b) E
(c) D   (d) C

Directions (56-60) : For each question you are given a frame of three sentences of which the middle sentence has been removed. Three possible fillers denoted by A, B and C are provided. One or more than one or none might fit. After using the filler(s) the completed frame must be compact and well organised presentation of the idea implied in it. select the most appropriate answer in each case.

56. Most races would refuse to eat the flesh of many unclean animals. (.......) The kind of food eaten depends very often on custom or habit.

A. Brahmins do not touch meat.

B. Mohammedans and Jews do not eat the flesh of pigs.

C. The flesh of animals is rich in protein.
(a) Only A and B   (b) Only B
(c) Only C   (d) Neither A nor B

57. Alcohol is taken in almost all cool and cold climates, and to a very much less extent in hot ones (.......) Alcohol is not necessary in anyway to anybody.

A. Thus, it is taken by people who live in the Himalayas.

B. But not nearly so much by those who live in plains of India.

C. Millions of people are beginning to do without it entirely.
(a) Only A   (b) Only B
(c) Only A and B   (d) All A, B and C

58. The great advantage of early rising is the good start it gives us in our day's work. (.......) In the early morning the mind is fresh and there are few distractions.
   A. Works done early in the morning are well done.
   B. The early riser had done a large amount of work before other men have got out of bed.
   C. In many cases an early riser finds time to take some exercise.
   (a) Only A   (b) Only B
   (c) Only A and B   (d) Only A and C

59. A great part of Arabia is desert. (.......) Here and there in the desert are springs of water that come from deep down under the ground.
   A. These springs are few and far apart.
   B. There is nothing but sand and rock.
   C. The sand is so hot in day time that you cannot walk over it with bare feet.
   (a) Only B and C   (b) Only A
   (c) Only B   (d) Either A or B

60. But to read nothing but books of fictions is like eating nothing but cakes. (.......) As we need plain, wholesome food for the body, so we must have serious reading for the mind.
   A. We can choose books according to our taste.
   B. Books are the most faithful of all friends.
   C. Our friends may change or die but our books are always patiently waiting to talk to us.
   (a) Only A   (b) Only B
   (c) Only C   (d) None of these

Directions (61-65) : In each of the following sentences there are two blank spaces. Below each sentence there are five pair of words denoted by numbers (a), (b), (c) and (d). Find out which pair of words can be filled up in the blanks in the sentence in the same sequence to make the sentence meaningfully complete.

61. If the banks desire to .... profit, they should get rid of .... measures.
   (a) lose, concentrate   (b) increase, populist
   (c) earn, unhealthy   (d) maximise, traditional

62. He was immature in this young age when he became completely .... by German and writing of Shakespeare.
   (a) ncollapsed, army   (b) engrossed, people
   (c) captivated, literature (d) seized, soldiers

63. The man who does not .... that the good of every living creature is him .... is a fool.
   (a) see, good   (b) know, had
   (c) understand, ugly   (d) see, worse

64. Being a kind hearted master, he never .... too .... work on his servants.
   (a) does, much   (b) entrusts, easy
   (c) performs, little   (d) imposes, much

65. On account of the.......... of grass on the arid plains the cattle became ....
   (a) dearth, emaciated
   (b) dearth, flippant
   (c) abundance, arrangement
   (d) sacrifice, agitated

Directions (Q. 66-70) : Which of the following phrases (a), (b), (c), and (d) given below each sentence should replace the phrase printed in bold type to make the sentence grammatically correct?

66. He is a healthy man, he always uses to go for a morning walk.
   (a) goes   (b) has gone
   (c) is going   (d) using to go

67. I was very tired when I met you because I was moving in my lawn for two hours.
   (a) had moved   (b) had been moved
   (c) had been moving   (d) was being moved

68. We left the place only after we were promised that we would be brought to that place again.
   (a) promised that   (b) had promised that
   (c) were promised to   (d) no correction required

69. Yesterday I could not resist my temptation and out of curiosity. I peep into the room.
   (a) peep at the room
   (b) peeped at the room
   (c) have peeped into the room
   (d) peeped into the room

70. I met the boy who was my friend's brother and whom name was Shyam.
   (a) and whom name is   (b) and who name was
   (c) and whose name was   (d) and whose name is

Directions (Q. 71-80) : In the following passage there are blanks, each of which has been numbered. These numbers are printed below the passage and against each, five words are suggested, one of the which fits the blank appropriately. Find out the appropriate word in each case.

A day light can be seen 71 very small holes, so little things will 72 a person's character. Indeed consists in little acts well and 73 performed: daily life being the 74 from which build it up and rough 75 the habits which form it. One of the more marked test of character is the manner in which we 76 ourselves towards others, a graceful behaviour, towards superiors, inferiors, and 77 is constant source of pleasure. It pleases other because it indicates 78 for their personality, but it gives tenfole more 79 to ourselves. Every man may, to large extent be a self educator in good 80 as in every else, he can be civil and kind if he thinks he has not a penny in his purse.

71. (a) through   (b) out of
   (c) in   (d) by

72. (a) darken   (b) characterise
    (c) adorn   (d) illustrate
73. (a) equally   (b) honourably
    (c) roughly   (d) officially
74. (a) house   (b) livelihood
    (c) quarry   (d) relation
75. (a) spouse   (b) give up
    (c) new   (d) watch
76. (a) conduct   (b) manage
    (c) nature   (d) present
77. (a) equals   (b) juniors
    (c) seniors   (d) superiors
78. (a) happiness   (b) honour
    (c) regard   (d) respect
79. (a) force   (b) requirement
    (c) pleasure   (d) dedication
80. (a) status   (b) behaviour
    (c) character   (d) career

Directions (Q. 81-90) : Read the following passage carefully and answer the questions given below it. Certain words or groups of words are given in bold type to help you locate them while answering some of the questions.

It is said that there is a dismal fall of standards everywhere. The leaders who are not equal to the task misguide their followers. The remedy of the malady that affects our political economic and social practices lies in the human individual. What is needed is a change in his nature. For that we should read great classics. Literature brings about that change for the better. It improves the quality of human beings. Great books give great thoughts, broaden our outlook and awaken our souls. They also provide a moral base as the lack of discipline and ideals is inimical to civilized value.

There are various kinds of books. Some arouse or instruct while others elevate our nature. The first kind of books destroy our ego and give us joy. Now joy is different from pleasure. The books which give joy contain emotions and thoughts recollected in tranquility. Only a seer can produce such books. They deserve not only to read but also to be digested. Through them we establish contract with the mastermind of the past. They hand on to us our tradtion. But maintaining a tradition does not mean peaking or doing as our forefathers did following a tradition blindly will render it dead and useles. We must make adaptations and bring modifications. However, the individual contriution is largely determined by the pressure brought to bear up on him by the new problems of the new age.

There are three clearly marked features of the age in which we live. They are the scientific and technological revolution, the liberation of dependent countries in Asia and Africa and the growing unity of the world : We should read books which trace the histroy of the above mentioned three moments. The intellectual wealth of all mankind is at our disposal, we should break the barriers of language. Books build bridge between cultures, that is they bring them together. They promote understanding and love and remove suspicion, fear and hatred.

Gread books come to our help when our values are at the discount many of us are mere shadows of human beings. We are the victims of contradictory impulses, we are a bundle of fear suspicion, greed, jealousy as well as kindliness and goodwill. For creating a normal harmonious human society the former instincts should be curbed and the latter kindled, we must guard against corrupting the minds of our people with trivialities. A general spiritual awakening is essential.

81. What are the three chief features of our age according to the passage ?
    (a) It is the age of scientific and technological revolution.
    (b) Many countries in Asia and Africa have not freedom from dependence.
    (c) A sense of unity is growing among the different countries of the world.
    (d) All of these
82. According to the passage, how can we keep our tradition alive ?
    (a) We can do so only by following our forefathers blindly.
    (b) It can be maintained only by making old traditions dead and useles.
    (c) It can be achieved through a deep faith in old traditions.
    (d) We can keep them alive by making critical and creative changes in them according to the demands of the age.
83. What is the main argument of the passage?
    (a) We should think in terms of the welfare of humanity as a whole.
    (b) One should read good books and do the works relevant to one's own welfare.
    (c) We should use scientific and technological know-how in terms of our welfare.
    (d) All of these

84. How can the nature of the individual be changed according to the passage ?
    (a) If he reads great books his outlook will be broad, his psychological health will improve and he will have moral contentment and spiritual joy.
    (b) If he reads great books only his psychological health will improve.
    (c) If he reads great books he will have only moral contentment and spiritual joy.
    (d) Not given in the passage.

85. What does the author consider essential for creating a normal harmonius human society ?
    A. We should control our emotions of fear, greed, suspicion and jealousy.
    B. We should encourage kindliness.
    C. We should not engage our mind in petty and mean things.
    D. There should be a general spirtual awakening among us.
    (a) Only A and B   (b) Only A, B and C
    (c) Only B and D   (d) All A, B, C and D

86. Which of the following statements A, B and / or C is /are NOT TRUE in the context of the passage ?
    A. Only those books which entertain us can elevate our nature.
    B. Men suffer from conflicting attitudes.
    C. All the evils of the world arise from the fact that men are unable to sit still in a place.
    (a) Only B and C   (b) Only A and B
    (c) Only A and C   (d) Only B

Directions (Q. 87-88) : Choose the word or the group of words which is most nearly the SAME in meaning of the word given in bold at the question place as used in the passage.

87. DISMAL
    (a) depressing   (b) disabled
    (c) bitter   (d) level-heated

88. ADAPTATION
    (a) support   (b) substance
    (c) adjustment   (d) deviation

Directions (89-90) : Choose the word or the group of words which is most nearly the OPPOSITE in meaning of hte word given in bold at the question place as used in the passage.

89. ELEVATE
    (a) argue   (b) convince
    (c) indulge   (d) lessen

90. TRIVIALITIES
    (a) essentials   (b) emoluments
    (c) promises   (d) details

Directions (Q. 91-100) : In the following passage there are blanks, each of which has been numbered. These numbers are printed below the passage and against each, five words are suggested, one of which fits the blank appropriately. Find out the appropriate word in each case.

One day my son called me after his exams. I could make out from his voice that he was (91). "The exam did not go so well. It was not that I did not know but I made a careless mistake." I tried to (92) him saying, "Don't worry, you will do better next time." He was not pleased to hear my words. "You don't realise how competitive it is here and how difficult it is to (93) anything."

A few days later I got another call from him. "A (94) thing happened", he said. "When I got my paper I saw that I had (95) marks for the question I had answered incorrectly. My friends (96) me to keep quiet as the Professor must have made a mistake. But you taught me the value of honesty so I emailed him saying I did not (97) the marks." His reply was more surprising. "It was (98)," he said. "My interaction with you throughout the year (99) me that you knew how to solve the problem. That is the reason I gave you those marks."

I was happier about my son's (100) than his marks.

91. (a) bother   (b) sad
    (c) unwell   (d) distress
92. (a) pity   (b) forgive
    (c) console   (d) cheer
93. (a) strive   (b) triumph
    (c) succeed   (d) achieve
94. (a) thrilled   (b) routine
    (c) disastrous   (d) funny
95. (a) assigned   (b) awarded
    (c) obtain   (d) received
96. (a) suggested   (b) advised
    (c) warn   (d) made
97. (a) deserve   (b) qualify
    (c) need   (d) receive
98. (a) knowing   (b) mistaken
    (c) oversight   (d) deliberate
99. (a) persuade   (b) merited
    (c) convinced   (d) proved
100. (a) value   (b) moral
     (c) truth   (d) honesty

QUANTITATIVE APTITUDE

101. Which of the following equations are equivalent?

A. $\left(\dfrac{x}{4}\right)^3 - \left(\dfrac{y}{2}\right)^3$

B. $\left(\dfrac{x}{4} + \dfrac{y}{2}\right)^3 - \dfrac{3xy}{8}\left(\dfrac{x}{4} + \dfrac{y}{2}\right)$

C. $\left(\dfrac{x}{4} + \dfrac{y}{2}\right)\left(\dfrac{x^2}{16} - \dfrac{xy}{8} + \dfrac{y^2}{4}\right)$

D. $\dfrac{1}{8}\left(\dfrac{x}{2} + y\right)\left(\dfrac{x^2}{4} - \dfrac{xy}{2} + y^2\right)$

(a) A and D
(b) B and C
(c) B, C and D
(d) A, B and C

102. Find the wrong part in the following equation :

(a) $5319.34 + 9872.64 \div 4 =$

(b) $3249.1 + 4\,(1134.6) =$

(c) $3\,(1253.24) + 3687.78 =$

(d) $6728.35 - 2345.62 + 3404.77 =$

103. Find the approximate value that should fill up (?) to make the following equation true :

    12% of 80 + 15 % or 75 = ?

(a) 21
(b) 20
(c) 19
(d) 22

104. How much time will a man take to complete a race of 1500 m if he runs at 20 km/hr ?

(a) 4 minutes
(b) $4\dfrac{1}{4}$ minutes

(c) $4\dfrac{1}{3}$ minutes
(d) $4\dfrac{1}{2}$ minutes

105. A palace has total 18 gates of which 2 are permanently closed. To check visitior ssecurity men stand on 12 gates. What is the probability that a man can enter the palace unchecked ?

(a) $\dfrac{1}{4}$
(b) $\dfrac{2}{9}$

(c) $\dfrac{2}{3}$
(d) Data inadequate

Directions (Q. 106-110) : In each question below equations are given, find the relatin between x and y and mark your answer as

(a) if $x = y$
(b) if $x > y$
(c) if $x < y$
(d) if $x \geq y$

106. $\dfrac{3}{4} \times \dfrac{7}{6} x = \dfrac{12}{15} \times \dfrac{25}{24} y$

107. $\dfrac{42}{33} \times \dfrac{12}{7} x = \dfrac{18}{7} \times \dfrac{28}{27} y$

108. I. $x + y = 16$
II. $x^2 + y^2 + xy = 192$

109. I. $x^2 - 8x + 16 = 0$
II. $y^2 - 7y + 12 = 0$

110. I. $x^2 - 13x + 42 = 0$
II. $y^2 - 12x + 36 = 0$

111. In an examination Ravi got 30% more marks than Vijay. The marks obtained by Shyam are equal to the average of the Imarks secured by Ravi and Mohan, What is the average marks of the four ?

A. Total marks in the examination are 400.
B. Vijay's marks are 200.
C. Shyam's marks are 250.

Which of the above statements A, B, C is/are necessary / sufficient to answer the question ? To choose the answer, mark :

(a) if A or B or C alone is sufficient
(b) if A and B together are necessary
(c) if B and C together are neccessary.
(d) if A and C together are necessary.

112. Which of the following numbers are divisible by 12 ?

A. 495036
B. 454758
C. 385356
D. 361768

(a) A and B only
(b) A and C only
(c) A and D only
(d) B and C only

113. What is the result of

    $98543 + 21457 - (12125 \times 8)$?

(a) 31200
(b) 21750
(c) 23000
(d) 30200

114. Find the value of $\dfrac{16}{25} + \dfrac{12}{75} \times \dfrac{5}{28} + \dfrac{2}{7}$

(a) 3
(b) $4\dfrac{3}{7}$

(c) $7\dfrac{6}{5}$
(d) 1

115. Calculate the value of $\dfrac{(45)^2 \times (24)^2}{(27)^2 - (23)^2}$

(a) 4372
(b) 5832
(c) 3250
(d) 4568

116. A man buys a certain number of bulbs for ₹ 300. He could have bought 5 more bulbs for the same amount and the bulbs been ₹ 2 cheaper. Find the no. of bulbs bought.

(a) 20
(b) 25
(c) 30
(d) Data inadequate

117. A tank is connected to two pipes. One of these pipes can fill the tank in 15 minutes while the other can empty it in 10 minutes. If the tank is initially $\frac{3}{5}$ th full and both pipes are simultaneously opened how much time it will take to fill or empty the tank ?
(a) 10 minutes   (b) 12 minutes
(c) 15 minutes   (d) 18 minutes

118. A family consumed 30 kgs of oil in 1994. The consumption is trebled in every 5 years. What was the consumption in the year 2004 ?
(a) 250 kgs   (b) 270 kgs
(c) 300 kgs   (d) 350 kgs

119. A, B and C together start a business. The amounts invested by A and B are in the ratio 4 : 3 whereas the ratio of investments of B and C is 2 : 3. If the total profit earned is ₹ 46000. What is C's share in the profit?
(a) ₹ 14000   (b) ₹ 15000
(c) ₹ 16000   (d) ₹ 18000

120. The sum of squares of two numbers is , 1700 and difference of their squares is 348. Find the numbers.
(a) 26 and 32   (b) 34 and 24
(c) 16 and 28   (d) Data insufficient

121. What should come in place of question mark (?) in the following equation ?

$$8\frac{2}{3} + 5\frac{1}{4} \times 4\frac{2}{7} - 3\frac{1}{2} = ?$$

(a) $27\frac{2}{3}$ (b) $9\frac{1}{3}$
(c) $18\frac{5}{7}$ (d) 3

122. The difference between successive discounts of 40% followed by 30% and 45% followed by 20% on the marked price of a shirt is ₹ 12. What is the marked price of the shirt ?
(a) ₹ 250   (b) ₹ 400
(c) ₹ 600   (d) Data insufficient

123. Exchange rate of dollar vs rupee increases at the rate of 5% per month. If the current rate is ₹ 40 per dollar, what will be the rate at the end of 2 months ?
(a) ₹ 45   (b) ₹ 44
(c) ₹ 45.4   (d) ₹ 44.1

124. A person invests ₹ 5000 at 5% p.a. simple interest for a certain period and earns ₹ 750. If he earns ₹ 720 on ₹ 6000 in the same time period what is the rate of interest ?
(a) 6 %   (b) 4 %
(c) 5 %   (d) 3 %

125. The marked prices of articles in a shop are 20% more than their cost prices. The shopkeeper gives a discount of ₹ 40 on a purchase of ₹ 960. What is net percent profit ?
(a) 10 %   (b) 12 %
(c) 15 %   (d) Data inadequate

Directions (126-130) : Study the following graph carefully and answer the questions below it.

Sales of a company

126. In which years total turnover of the company exceeds ₹ 15 crores ?
(a) 2000-2001 and 2001-2002
(b) 2000-2001 and 2002-2003
(c) 2001-2002 and 2002-2003
(d) 2002-2003 and 2003-2004

127. In which year the rate of growth of export is maximum ?
(a) 1999-2000   (b) 2000-2001
(c) 2001-2002   (d) 2002-2003

128. What is the ratio of export to domestic sales in 2003-2004 ?
(a) 2 : 1   (b) 2 : 3
(c) 3 : 2   (d) 3 : 4

129. What is the difference between average domestic sales and exports during 5 years?
(a) ₹ 1.8 Cr   (b) ₹ 2.4 Cr
(c) ₹ 1.6 Cr   (d) ₹ 3.8 Cr

130. In which year % growth in domestic sales maximum ?
(a) 2003-2004   (b) 2002-2003
(c) 2001-2002   (d) 2000-2001

Directions (131-135) : In each of the following questions a number series is given. A number in the series is represented by x. You have to find out the number in the place of x and use this number ot find out the value in the place of question mark (?) in the equation following the series.

131. 23, 30, x, 53, 69, 88, 110.
$x^2 - 500 = ?$
(a) 1000   (b) 1100
(c) 1200   (d) 1300

132. 16, 21, 30, 45, x, 101
$x + 12 = ? \div 4$
(a) 320   (b) 325
(c) 330   (d) 340

133. 15, 35, 75, x, 315, 635

     x ÷ 30 = ?

     (a) $4\dfrac{1}{3}$ (b) $5\dfrac{1}{2}$

     (c) $4\dfrac{1}{2}$ (d) $5\dfrac{1}{6}$

134. 576, 24, 2.25, 1.5, 1.4641, x

     x × 4.5 = ?

     (a) 4.455   (b) 4.545

     (c) 5.445   (d) 4.554

135. x, $\dfrac{3}{10}, \dfrac{1}{5}, \dfrac{1}{10}, \dfrac{1}{15}, \dfrac{1}{30}$

     x + $\dfrac{2}{5}$ = ?

     (a) 1   (b) $\dfrac{4}{5}$

     (c) $\dfrac{3}{5}$ (d) $\dfrac{2}{5}$

Directions (136-140) : Read the following table carefully and answer the questions below it.

Number of Registered Vehicles

Year	Cars	Buses	Trucks	Scooters	Others	Total
1980-1981	4.77	1.02	2.46	0.81	0.12	9.18
1990-1991	9.27	1.71	5.04	2.85	1.08	19.95
2000-2001	25.38	3.51	11.04	45.27	11.82	97.02

136. In the year 1990-1991 what was the ratio (approximately) of the total number of buses, trucks and other vehicles to that of cars and scooters ?

     (a) $\dfrac{13}{20}$ (b) $\dfrac{10}{13}$

     (c) $\dfrac{13}{10}$ (d) $\dfrac{20}{13}$

137. The increase in the number of scooters from 1980-1981 to 2000-2001 is what per cent of that of total vehicles ?

     (a) 21   (b) 31

     (c) 41   (d) 46

138. Which vehicle registered a minimum increase from 1990-1991 to 2000-2001 ?

     (a) Buses   (b) Trucks

     (c) Scooters   (d) Other vehicles

139. If percent increase in the number of vehicles for the decade 1990-1991 to 2000-2001 whre the same as that from the decade 1980-1981 to 1990-1991. What should have been number of vehicles (in lakhs) during 2000-2001 ?

     (a) 42   (b) 42.5

     (c) 43.15   (d) 43.55

140. Which vehicle registered maximum percent increase from 1980-1981 to 1990-1991 ?

     (a) Cars

     (b) Trucks

     (c) Scooters

     (d) Other vehicles

Directions (Q. 141-150) : What should come in place of the question mark (?) in the following questions ?

141. 47.7 × 12.4 × 8.6 =?

     (a) 5708.423   (b) 5218.665

     (c) 6180.656   (d) 5086.728

142. $4\dfrac{4}{5} \div 6\dfrac{2}{5} = ?$

     (a) $\dfrac{3}{4}$ (b) $\dfrac{5}{7}$

     (c) $\dfrac{7}{11}$ (d) $\dfrac{5}{8}$

143. 1193.85 ÷ (42 × 1.5) =?

     (a) 18.95   (b) 16.25

     (c) 19.18   (d) 14.64

144. 7719 + 8725 + 9124 =?

     (a) 21911   (b) 28388

     (c) 20578   (d) None of these

145. 8.7 ×? = 46.98

     (a) 5.3   (b) 6.9

     (c) 4.7   (d) None of these

146. $27^2 \times 4^3 - 111^2$ =?

     (a) 33455   (b) 35334

     (c) 34335   (d) 35344

147. 7777 ÷ 77 ÷ 5 =?

     (a) 50.5   (b) 18.5

     (c) 22.4   (d) None of these

148. 8878 – 4125 – 1157 =?

     (a) 4185   (b) 3078

     (c) 2186   (d) None of these

149. $\dfrac{2}{5}$ of $\dfrac{1}{3}$ of $\dfrac{3}{5}$ of 48685 =?

     (a) 3287.5   (b) 3415.6

     (c) 3894.8   (d) 2967.4

150. 421 × 38 – 3543 =?

     (a) 15112

     (b) 10624

     (c) 12455

     (d) 13185

COMPUTER AWARENESS

151. Consider the following two statements about the function $f(x) = |x|$
   P. f (x) is continuous for all real values of x
   Q. f(x) is differentiable for all real values of x
   Which of the following is TRUE?
   (a) P is true and Q is false.
   (b) P is false and Q is true
   (c) Both P and Q are true
   (d) Both P and Q are false

152. Let S be a set of n elements. The number of ordered pairs in the largest and the smallest equivalence relations on S are
   (a) n and n
   (b) n^2 and n
   (c) n^2 and 0
   (d) n and 1

153. What is the maximum number of different Boolean functions involving n Boolean variables ?
   (a) n^2
   (b) 2^n
   (c) 2^{2^n}
   (d) 2^{n^2}

154. Let G be the non-planar graph with the minimum possible number of edges. Then G has
   (a) 9 edges and 5 vertices
   (b) 9 edges and 6 vertices
   (c) 10 edges and 5 vertices
   (d) 10 edges and 6 vertices

155. Consider the DAG with V = {1,2,3,4,5,6}, shown below

   Which of the following is NOT a topological ordering ?
   (a) 1 2 3 4 5 6
   (b) 1 3 2 4 5 6
   (c) 1 3 2 4 6 5
   (d) 3 2 4 1 6 5

156. Which of the following problems is undecidable ?
   (a) Membership problem for CFGs.
   (b) Ambiguity problem for CFGs.
   (c) Finiteness problem for FSAs
   (d) Equivalence problem for FSAs

157. Which of the following is TRUE?
   (a) Every subset of a regular set is regular
   (b) Every finite subset of a non-regular set is regular
   (c) The union of two non-regular sets is not regular
   (d) Infinite union of finite sets is regular

158. How many 3-to-8 line decoders with an enable input are needed to construct a 6-to-64 line decoder without using any other logic gates ?
   (a) 7
   (b) 8
   (c) 9
   (d) 10

159. Consider the following Boolean function of four variables

   $$f(w, x, y, z) = \sum(1, 3, 4, 6, 9, 11, 12, 14)$$

   The function is
   (a) independent of one variable
   (b) independent of two variables
   (c) independent of three variables
   (d) dependent on all the variables

160. Consider a 4-way set associative cache consisting of 128 lines with a line size of 64 words. The CPU generates a 20-bit address of a word in main memory. The number of bits in the TAG, LINE and WORD fields are respectively
   (a) 9, 6, 5
   (b) 7, 7, 6
   (c) 7, 5, 8
   (d) 9, 5, 6

161. Consider a disk pack with 16 surfaces, 128 tracks per surface and 256 sectors per track. 512 bytes of data are stored in a bit serial manner in a sector. The capacity of the disk pack and the number of bits required to specify a particular sector in the disk are respectively
   (a) 256 Mbyte, 19 bits
   (b) 256 Mbyte, 28 bits
   (c) 512 Mbyte, 20 bits
   (d) 64 Gbyte, 28 bits

162. The height of a binary tree is the maximum number of edges in any root to leaf path. The maximum number of nodes in a binary tree of height h is
   (a) 2^h
   (b) $2^{h-1}-1$
   (c) $2^{h+1}-1$
   (d) 2^{h+1}

163. The maximum number of binary trees that can be formed with three unlabeled nodes is
   (a) 1
   (b) 5
   (c) 4
   (d) 3

164. Which of the following sorting algorithms has the lowest worst-case complexity ?
   (a) Merge sort
   (b) Bubble sort
   (c) Quick sort
   (d) Selection sort

165. Consider the following segment of C-code

```
int J, n;
      j = 1;
   while (j < = n)
         j = j* 2;
```

   The number of comparisons made in the execution of the loop for any n > 0 is
   (a) $\lceil \log_2 n \rceil + 1$
   (b) n
   (c) $\lceil \log_2 n \rceil$
   (d) $\lfloor \log_2 n \rfloor + 1$

166. Group 1 contains some CPU scheduling algorithms and Group 2 contains some applications. Match entries in Group 1 to entries in Group 2.

Group 1	Group 2
P. Gang Scheduling	1. Guaranteed Scheduling
Q. Rate Monotonic Scheduling	2. Real-time Scheduling
R. Fair Share Scheduling	3. Thread Scheduling

   (a) P-3; Q-2; R-1   (b) P-1; Q-2; R-3
   (c) P-2; Q-3; R-1   (d) P-1; Q-3; R-2

167. Consider the following statements about user level threads and kernel level threads. Which one of the following statements is FALSE ?
   (a) Context switch time is longer for kernel level threads than for user level threads.
   (b) User level threads do not need any hardware support
   (c) Related kernel level threads can be scheduled on different processors in a multiprocessor system
   (d) Blocking one kernel level thread blocks all related threads

168. Which one of the following is a top-down parser ?
   (a) Recursive descent parser
   (b) Operator precedence parser
   (c) An LR(k) parser
   (d) An LALR(k) parser

169. In Ethernet when Manchester encoding is used, the bit rate is
   (a) Half the baud rate
   (b) Twice the baud rate
   (c) Same as the baud rate
   (d) None of these

170. Which one of the following uses UDP as the transport protocol ?
   (a) HTTP   (b) Telnet
   (c) DNS   (d) SMTP

171. How many different non-isomorphic Abelian groups of order 4 are there ?
   (a) 2   (b) 3
   (c) 4   (d) 5

172. Let Graph(x) be a predicate which denotes that x is a graph. Let Connected(x) be a predicate which denotes that x is connected. Which of the following first order logic sentences DOES NOT represent the statement; "Not every graph is connected"?
   (a) $\neg \forall x$ (Graph(x) $\Rightarrow$ Connected (x))
   (b) $\exists x$ (Graph(x) $\wedge \neg$ Connected (x))
   (c) $\neg \forall x$ ($\neg$ Graph(x)) $\vee$ Connected(x))
   (d) $\forall x$(Graph(x) $\Rightarrow \neg$ Connected(x))

173. Which of the following graphs has an Eulerian circuit ?
   (a) Any k-regular graph where k is an even number
   (b) A complete graph on 90 vertices
   (c) The complement of a cycle on 25 vertices
   (d) None of the above

174. Suppose we uniformly and randomly select a permutation from the 20! permutations of 1, 2, 3...., 20. What is the probability that 2 appears at an earlier position than any other even number in the selected permutation ?
   (a) $\dfrac{1}{2}$ (b) $\dfrac{1}{10}$
   (c) $\dfrac{9!}{20!}$ (d) None of these

175. Let A be a 4 × 4 matrix with eigenvalues –5, –2, 1, 4. Which of the following is an eigenvalue of $\begin{bmatrix} A & I \\ I & A \end{bmatrix}$, where I is the 4 × 4 identity matrix ?
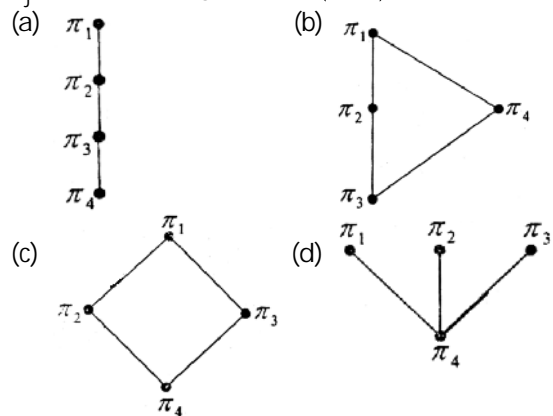   (a) –5   (b) – 7
   (c) 2   (d) 1

176. Consider the set S = {a, b, c, d}. Consider the following 4 partitions π_1, π_2, π_3, π_4 on
   S: $\pi_1 = \{\overline{abcd}\}$, $\pi_2\{\overline{ab}, \overline{cd}\}$, $\pi_3 = \{\overline{abc}, \overline{d}\}$,
   $\pi_4 = \{\overline{a}, \overline{b}, \overline{c}, \overline{d}\}$.
   Let $\prec$ be the partial order on the set of partitions S' = {π_1, π_2, π_3, π_4} defined as follows : $\pi_i \prec \pi_j$ if and only if π_i refines π_j. The poset digram for $(S', \prec)$

177. Consider the set of (column) vectors defined by X = {x $\in$ R^3 | $x_1 + x_2 + x_3 = 0$, where $x^T = [x_1, x_2, x_3]^T$}. Which of the following is TRUE?
   (a) {$[1, -1, 0]^T$, $[1, 0, -1]^T$} is a basis for the subspace X.
   (b) {$[1, -1, 0]^T$, $[1, 0, -1]^T$} is a linearly independent set, but it does not span X and therefore is not a basis of X
   (c) X is not a subspace of R^3
   (d) None of the above

178. Consider the series $x_{n+1} = \dfrac{x_n}{2} + \dfrac{9}{8x_n}$, $x_0 = 0.5$ obtained from the Newton-Raphson method. The series converges to
    (a) 1.5
    (b) $\sqrt{2}$
    (c) 1.6
    (d) 1.4

179. A minimum state deterministic finite automaton accepting the language

    $L = \{w | w \in \{0,1\}^*$, number of 0s and 1s in w are divisible by 3 and 5, respectively$\}$ has
    (a) 15 states
    (b) 11 states
    (c) 10 states
    (d) 9 states

180. The language $L = \{0^i 21^i | i \geq 0\}$ over the alphabet $\{0, 1, 2\}$ is
    (a) not recursive
    (b) is recursive and is a deterministic CFL
    (c) is a regular language
    (d) is not a deterministic CFL but a CFL

181. Which of the following languages is regular ?
    (a) $\{ww^R | w \in \{0,1\}^+\}$
    (b) $\{ww^R x | x, w \in \{0,1\}^+\}$
    (c) $\{wxw^R | x, w \in \{0,1\}^+\}$
    (d) $\{xww^R | x, w \in \{0,1\}^+\}$

182. Let $f(w, x, y, z) = \sum(0,4,5,7,8,9,13,15)$. Which of the following expressions are NOT equivalent to f ?
    (a) $x'y'z' + w'xy' + wy'z + xz$
    (b) $w'y'z' + wx'y' + xz$
    (c) $w'y'z' + wx'y' + xyz + xy'z$
    (d) $x'y'z' + wx'y' + w'y$

183. Define the connective * for the Boolean variable X and Y as : $X * Y = XY + X'Y'$
    Let $Z = X * Z$.
    Consider the following expression P, Q and R.
        P : X = Y * Z   Q :   Y = X * Z
            R : X * Y * Z = 1
    Which of the following is TURE ?
    (a) Only P and Q are valid
    (b) Only Q and R are valid
    (c) Only P and R are valid
    (d) All P, Q, R are valid

184. Suppose only one multiplexer and one inverter are allowed to be used to implement any Boolean function of n variables. What is the minimum size of the multiplexer needed?
    (a) 2^n line to 1 line
    (b) 2^{n+1} line to 1 line
    (c) 2^{n-1} line to 1 line
    (d) 2^{n-2} line to 1 line

185. In a look-ahead carry generator, the carry generate function G_i and the carry propagate function P_i for inputs, A_i and B_i are given by :
    $$P_i = A_i \oplus B_i \text{ and } G_i = A_i B_i$$

The expressions for the sum bit S_i and the carry bit C_{i+1} of the look-ahead carry adder are given by:

$S_i = P_i \oplus C_i$ and $C_{i+1} = G_i + P_i C_i$,

where C_0 is the input carry.

Consider a two-level logic implementation of the look-ahead carry generator. Assume that all P_i and G_i are available for the carry generator circuit and that the AND and OR gates can have any number of inputs. The number of AND gates and OR gates needed to implement the look-ahead carry generator for a 4-bit adder with S_3, S_2, S_1, S_0 and C_4 as its outputs are respectively
    (a) 6, 3
    (b) 10, 4
    (c) 6, 4
    (d) 10, 5

186. The control signal functions of a 4-bit binary counter are given below (where X is "don't care"):

Clear	Clock	Load	Count	Function
1	X	X	X	Clear to 0
0	X	0	0	No change
0	↑	1	X	Load input
0	↑	0	1	Count next

The counter is connected as follows :
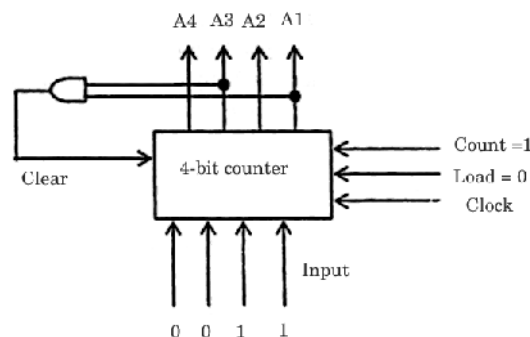
Assume that the counter and gate delays are negligible. If the counter starts at 0, then it cycles through the following sequence
    (a) 0, 3, 4
    (b) 0, 3, 4, 5
    (c) 0, 1, 2, 3, 4
    (d) 0, 1, 2, 3, 4, 5

187. Consider a pipelined processor with the following four stages :
    IF : Instruction Fetch
      ID : Instruction Decode and Operand Fetch
    EX : Execute
      WB : Write Back
    The IF, ID and WB stages take one clock cycle each to complete the operation. The number of clock cycles for the EX stage depends on the instruction. The ADD and SUB instructions need 1 clock cycle and the MUL instruction need 3 clock cycles in the EX stage. Operand forwarding is used in the pipelined processor. What is the

number of clock cycles taken to complete the following sequence of instructions ?

```
ADD     R2,   R1,   R0     R2 ← R1 + R0
MUL     R4,   R3,   R2     R4 ← R3 * R2
SUB     R6,   R5,   R4     R6 ← R5 – R4
```

(a) 7   (b) 8
(c) 10   (d) 14

188. The following postfix expression with single digit operands is evaluated using a stack

$$8\ 2\ 3\ ^\wedge\ /\ 2\ 3\ *\ +\ 5\ 1^*\ -$$

Note that ^ is the exponentiation operator. The top two elements of the stack after the first * is evaluated are

(a) 6, 1   (b) 5, 7
(c) 3, 2   (d) 1, 5

189. The inorder and preorder traversal of a binary tree are

d b e a f c g and a b d e c f g respectively.

The postorder traversal of the binary tree is

(a) d e b f g c a   (b) e d b g f c a
(c) e d b f g c a   (d) d e f g b c a

190. Consider a hash table of size seven, with starting index zero, and a hash function (3x + 4) mod 7. Assuming the hash table is initially empty, which of the following is the contents of the table when the sequence 1, 3, 8, 10 is inserted into the table using closed hashing ? Note that–denotes an empty location in the table.

(a) 8, –, –, –, –, –, 10   (b) 1, 8, 10, –, –, –, 3
(c) 1, –, –, –, –, –, 3   (d) 1, 10, 8, –, –, –, 3

191. In an unweighted, undirected connected graph, the shortest path from a mode S to every other node is computed most efficiently, in terms of time complexity, by

(a) Dijkstra's algorithm starting from S.
(b) Warshall's algorithm
(c) performing a DFS starting from S
(d) performing a BFS starting from S

192. Consider the following C function :

```
int f(int  n)
{static int r = 0;
   if (n < = 0) return 1;
   if (n > 3)
   (r = n;
      return f (n–2) + 2;
}
        return f(n–1) + r;
}
```

What is the value of f(5) ?

(a) 5   (b) 7
(c) 9   (d) 18

193. A complete n–ary tree is a tree in which each node has n children or no children. Let. I be the number of internal nodes and L be the number of leaves in a complete n-ary tree. If L = 41, and I = 10, what is the value of n

(a) 3   (b) 4
(c) 5   (d) 6

194. In the following C function, let n $\geq$ m.

```
int gcd(n,m)
{
     if(n%m == 0) return m;
     n = n%m;
     return gcd(m,n);
}
```

How many recursive calls are made by this fucntion ?

(a) $\Theta\ (\log_2 n)$ (b) $\Omega\ (n)$
(c) $\Theta(\log_2 \log_2 n)$ (d) $\Theta\!\left(\sqrt{n}\right)$

195. What is the time complexity of the following recursive function :

```
int DoSomething ( int n) {
  if   (n <= 2)
       return 1;
  else
return (DoSomething (floor  (sqrt(n))) + n);
  }
```

(a) $\Theta\!\left(n^2\right)$ (b) $\Theta(n\log_2 n)$
(c) $\Theta(\log_2 n)$ (d) $\Theta(\log_2 \log_2 n)$

196. Consider the following C program segment where Cell Node represents a node in a binary tree

```
struct CellNode {
struct CellNode * leftchild;
int element;
struct CellNode *rightchild;
};
 int GetValue(struct CellNode*ptr){
   int value = 0;
   if (ptr ! = NULL) {
     if ((ptr->leftChild == NULL) &&
       (ptr->rightChild == NULL))
       value = 1;
   else
       value = value + GetValue(ptr->leftChild)
                + GetValue
             (ptr->rightChild);
   }
   return(value);
}
```

The value returned by Get Value when a pointer to the root of a binary tree is passed as its argument is

(a) the number of nodes in the tree

(b) the number of internal nodes in the tree

(c) the number of leaf nodes in the tree

(d) the height of the tree

197. Consider the process of inserting an element into a Max Heap, where the Max Heap is represented by an array. Suppose we perform a binary search on the path from the new leaf to the root to find the position for the newly inserted element, the number of comparisons performed is

(a) $\Theta(\log_2 n)$ (b) $\Theta(\log_2 \log_2 n)$

(c) Θn (d) $\Theta(n \log_2 n)$

198. Which of the following is TRUE about formulae in Conjunctive Normal Form ?

(a) For any formula, there is a truth assignment for which at least half the clauses evaluate to true.

(b) For any formula, there is a truth assignment for a which all the clauses evaluate to true.

(c) There is a formula such that for each truth assignment at most one-fourth of the clauses evaluate to true.

(d) None of the above

199. Let w be the minimum weight among all edge weights in an undirected connected graph. Let e be a specific edge of weight w. Which of the following is FALSE ?

(a) There is a minimum spanning tree containing e.

(b) If e is not in a minimum spanning tree T, then in the cycle formed by adding e to T, all edges have the same weight.

(c) Every minimum spanning tree has an edge of weight w

(d) e is present in every minimum spanning tree

200. An array of n numbers is given, where n is an even number. The maximum as well as the minimum of these n numbers needs to be determined. Which of the following is TRUE about the number of comparisons needed ?

(a) At least 2n – c comparisons, for some constant c, are needed.

(b) At most 1.5n –2 comparisons are needed.

(c) At least $n \log_2 n$ comparisons are needed.

(d) None of the above.

ANSWERS

1. (b)	2. (c)	3. (d)	4. (d)	5. (a)	6. (a)	7. (d)	8. (b)	9. (c)	10. (a)
11. (d)	12. (b)	13. (b)	14. (d)	15. (c)	16. (a)	17. (c)	18. (b)	19. (c)	20. (c)
21. (b)	22. (d)	23. (a)	24. (b)	25. (d)	26. (c)	27. (a)	28. (d)	29. (d)	30. (c)
31. (a)	32. (c)	33. (c)	34. (a)	35. (c)	36. (b)	37. (d)	38. (a)	39. (d)	40. (d)
41. (d)	42. (d)	43. (b)	44. (d)	45. (d)	46. (b)	47. (d)	48. (c)	49. (a)	50. (d)
51. (d)	52. (d)	53. (c)	54. (b)	55. (a)	56. (a)	57. (d)	58. (c)	59. (a)	60. (d)
61. (b)	62. (c)	63. (a)	64. (d)	65. (a)	66. (a)	67. (c)	68. (d)	69. (d)	70. (c)
71. (a)	72. (d)	73. (b)	74. (c)	75. (c)	76. (a)	77. (a)	78. (d)	79. (c)	80. (b)
81. (d)	82. (d)	83. (a)	84. (a)	85. (d)	86. (c)	87. (a)	88. (c)	89. (d)	90. (a)
91. (b)	92. (c)	93. (d)	94. (d)	95. (d)	96. (a)	97. (a)	98. (d)	99. (c)	100. (d)
101. (c)	102. (c)	103. (a)	104. (d)	105. (a)	106. (c)	107. (b)	108. (a)	109. (d)	110. (d)
111. (c)	112. (b)	113. (c)	114. (d)	115. (b)	116. (b)	117. (d)	118. (b)	119. (d)	120. (a)
121. (a)	122. (c)	123. (d)	124. (b)	125. (c)	126. (d)	127. (b)	128. (c)	129. (a)	130. (b)
131. (b)	132. (a)	133. (d)	134. (c)	135. (a)	136. (a)	137. (d)	138. (a)	139. (d)	140. (d)
141. (d)	142. (a)	143. (a)	144. (d)	145. (d)	146. (c)	147. (d)	148. (d)	149. (c)	150. (c)
151. (a)	152. (b)	153. (c)	154. (b)	155. (d)	156. (b)	157. (b)	158. (b)	159. (b)	160. (b)
161. (a)	162. (c)	163. (b)	164. (a)	165. (d)	166. (a)	167. (d)	168. (a)	169. (b)	170. (c)
171. (b)	172. (d)	173. (a)	174. (d)	175. (d)	176. (c)	177. (b)	178. (a)	179. (a)	180. (b)
181. (c)	182. (d)	183. (d)	184. (c)	185. (c)	186. (d)	187. (b)	188. (a)	189. (a)	190. (b)
191. (d)	192. (d)	193. (c)	194. (c)	195. (d)	196. (c)	197. (a)	198. (b)	199. (d)	200. (d)

■■