

DO NOT BREAK THE SEAL OF THE BOOKLET UNTIL YOU ARE TOLD TO DO SO**SERIES : I****QUESTION BOOKLET****Subjects : General English, General Knowledge & Aptitude and
Computer Science****Full Marks : 350****Time Allowed : 2½ Hours***Read the following instructions carefully before you begin to answer the questions.***INSTRUCTIONS TO CANDIDATES**

1. This Booklet contains 175 questions to be answered in a separate OMR Answer Sheet using Black Ballpoint Pen in the following four Parts :

| | |
|--|------------------------|
| Part—A : General English | : 25 questions |
| Part—B : General Knowledge & Aptitude | : 50 questions |
| Part—C : Computer Science | : 100 questions |

2. All questions are compulsory.
3. You will be supplied the Answer Sheet separately by the Invigilator. You must complete the details of particulars asked for.
4. Answer must be shown by completely blackening the corresponding circle in the Answer Sheet against the relevant question number by Black Ballpoint Pen. OMR Answer Sheet without marking Series shall not be evaluated.

Example :

Suppose the following question is asked :

The Capital of Meghalaya is

- (A) Guwahati
(B) Kohima
(C) Shillong
(D) Delhi

You will have four alternatives in the Answer Sheet for your response corresponding to each question of the Question Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Shillong, then the same should be marked on the Answer Sheet by blackening the relevant circle with a Black Ballpoint Pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

5. Answer the questions as quickly and as carefully as you can. Some questions may be difficult and others easy. Do not spend too much time on any one question.
6. There will NOT be any negative marking for wrong answers.
7. The Answer Sheet must be handed over to the Invigilator before you leave the Examination Hall.
8. No Rough Work is to be done on the Answer Sheet. Space for Rough Work has been provided in the Question Booklet.

PART—A : GENERAL ENGLISH

(Marks : 50)

Each question carries 2 marks

Directions : In the following questions, a sentence is given in Direct/Indirect speech. Out of the four alternatives given, choose the one which best expresses in the same Direct/Indirect speech. Mark the correct answer in your answer sheet.

1. "What makes you so sad?" She asked Jane.

- (A) She asked Jane what makes her so sad.
- (B) She asks Jane what makes her so sad.
- (C) She asked Jane what made her so sad.
- (D) She asked Jane that makes her so sad.

2. Ben said to Betty, "Will you help me with my project just now?"

- (A) Ben told Betty whether if she would help him in her project just then.
- (B) Ben asked Betty if she would help him in his project just then.
- (C) Ben questioned to Betty that will you help me in my project just now.
- (D) Ben asked to Betty that she will help him in his work just now.

3. She asked Ravi, "What is worrying you?"

- (A) She asked Ravi what is worrying him.
- (B) She asks Ravi what was worrying him.
- (C) She asks Ravi what is worrying him.
- (D) She asked Ravi what was worrying him.

4. "Please don't cry", he said.

- (A) He begged that I should not cry.
- (B) He begged me not to cry.
- (C) He said to please him and not to cry.
- (D) He told me to not to cry.

5. I said to him, "Will you go to Delhi?"

- (A) I asked him will he go to Delhi.
- (B) I said to him would he go to Delhi.
- (C) I asked him if he would go to Delhi.
- (D) I said to him would you go to Delhi.

Directions : In the following questions, some sentences have errors and some do not. The underlined words are the key words where you can identify whether the sentence is erroneous or not. From the given set of choices, choose the correct alternative for the identified error. Where there is no error, choose the specified option (D). Mark the correct answer in your sheet.

6. A friendship founded on business is best than a business founded on friendship.

- (A) good than
- (B) better than
- (C) more better than
- (D) No errors

7. The crowd which has gather to protest against the decision slowly turned to their homes.

- (A) which had gathered
- (B) which have gather
- (C) gathering up
- (D) No errors

8. The bridge in connection with the two cities will remain closed for security reasons.

- (A) connecting
- (B) being connected from
- (C) connects between
- (D) No errors

9. Newspapers have great power because their enormous circulation.

- (A) on account
- (B) because of
- (C) as a result
- (D) No errors

10. Besides criticism of some supervisors, the Chairman still commands respect from the employees.

- (A) Despite criticism from
- (B) Without criticism of
- (C) Unless criticism of
- (D) No errors

Directions : In the questions below, there are jumbled up sentence parts. Rearrange the parts, which are labeled A, B, C and D to form the correct sentence. Choose the correct sequence from the given set of alternatives. Mark the correct answer in your answer sheet.

11. dog / Rahul / with his pet /
A B C
enjoys playing.
D

(A) ABCD

(B) BDCA

(C) CBDA

(D) ACBD

12. Vietnam / exports / good to /
A B C
the Company.
D

(A) DBCA

(B) BDCA

(C) ABCD

(D) ACBD

13. the grass / please / do not /
A B C
step on.
D

(A) ACBD

(B) BCDA

(C) DBCA

(D) ABCD

14. perfect sense / someday / everything /
A B C
will make.
D

(A) ABCD

(B) CBDA

(C) BDCA

(D) BCDA

15. not effect / sales last year /
A B
much improvement in / we did.
C D

(A) BCAD

(B) ABCD

(C) DACB

(D) CBAD

Directions : In the following cloze passage, there are blank spaces which are numbered. Against each number, choose the most appropriate word from the set of given alternatives. Mark the correct answer in your answer sheet.

Childhood is the time when there are 16 responsibilities to make life difficult. If a child 17 good parents, he is fed, looked 18 and loved, whatever he may do, it is improbable that he will ever again in his life 19 given so much without having to do anything 20 return.

16. (A) many
(B) little
(C) few
(D) more
17. (A) had
(B) have
(C) has
(D) will have
18. (A) up
(B) at
(C) after
(D) around
19. (A) is
(B) has
(C) are
(D) be
20. (A) for
(B) in
(C) as
(D) of

Directions : In the following questions, the sentences grammatically correct have blank spaces followed by four alternative answers. Choose the alternative from the given choices. Mark the correct answer in your answer sheet.

21. If I had known your problem _____.
(A) I would have helped you
(B) I had helped you
(C) I would help you
(D) I will help you
22. I had the jacket _____ as the sleeves were too long.
(A) adapted (B) altered
(C) amended (D) stitch
23. In fact, she must be _____ on for 50 now.
(A) reaching (B) approaching
(C) getting (D) coming
24. The money will be _____ to your account at the end of the month.
(A) converted
(B) transformed
(C) shifted
(D) transferred
25. The woman _____ my house was a criminal.
(A) to that I sold
(B) to which I sell
(C) to whom I sold
(D) to her I sold

PART—B : GENERAL KNOWLEDGE & APTITUDE

(Marks : 100)

Each question carries 2 marks

26. Which country launched the world's first nationwide 5G mobile network?
- (A) Japan
(B) China
(C) South Korea
(D) Malaysia
27. Which of the following States has decided to recruit women drivers for government vehicles?
- (A) Kerala
(B) Tamil Nadu
(C) Andhra Pradesh
(D) Telangana
28. MS Word is an example of
- (A) an operating system
(B) an application software
(C) a processing device
(D) an input device
29. National Income estimates in India are prepared by the
- (A) NITI Aayog
(B) Reserve Bank of India
(C) Indian Statistical Institute
(D) Central Statistical Organization
30. Hydrogen bomb is based on the principle of
- (A) nuclear fission
(B) nuclear fusion
(C) natural radioactivity
(D) artificial radioactivity
31. Which foreign country is closest to Andaman Islands?
- (A) Sri Lanka
(B) Indonesia
(C) Myanmar
(D) Pakistan
32. In India, National Income is calculated by the method which is known as
- (A) the combined method
(B) the income method
(C) the product method
(D) the expenditure method
33. In India, agriculture income is calculated by
- (A) the output method
(B) the input method
(C) the expenditure method
(D) the commodity flow method

34. The minimum forest cover to maintain ecological balance in the plains is
- (A) 25% (B) 33%
- (C) 40% (D) 50%
35. In the 'Index of Eight Core Industries', which one of the following is given the highest weight?
- (A) Coal production
- (B) Electricity generation
- (C) Fertilizer production
- (D) Steel production
36. In which decade the population of India recorded a negative growth rate?
- (A) 1911-21 (B) 1921-31
- (C) 1931-41 (D) 1941-51
37. Where is the headquarters of The National Film Archive of India (NFAI) located?
- (A) Mumbai (B) Kolkata
- (C) Pune (D) Chennai
38. Who is the author of the book, *Annihilation of Caste*?
- (A) Mahatma Gandhi
- (B) B. R. Ambedkar
- (C) Arundhati Roy
- (D) Martin Luther King Jr.
39. Which of the following best defines disposable income?
- (A) Income received by households less personal taxes
- (B) The before-tax income received by households
- (C) All income earned by resource suppliers for their current contributions to production
- (D) The market value of the annual output net of consumption of fixed capital
40. How many types of emergencies are envisaged by the Constitution?
- (A) 1 (B) 2
- (C) 3 (D) Nil
41. The first nuclear submarine which was acquired by the Indian Navy was named
- (A) Nag (B) INS Arihant
- (C) Agni (D) Gangotri
42. Where is the oldest oil refinery of India located?
- (A) Cochin (B) Haldia
- (C) Digboi (D) Barauni
43. Which one of the following countries is **not** a member of ASEAN?
- (A) Brunei
- (B) Cambodia
- (C) Vietnam
- (D) India

44. Which of the following languages is **not** the official language of the United Nations?

- (A) Arabic
- (B) Chinese
- (C) Portuguese
- (D) Spanish

45. What is the length of each stump in cricket?

- (A) 28 inches
- (B) 32 inches
- (C) 2 ft.
- (D) 2½ ft.

46. The first Defence Minister of India was

- (A) K. M. Cariappa
- (B) Gopalaswami Ayyangar
- (C) Baldev Singh
- (D) Sardar Patel

47. Karachi is situated on the bank of which river?

- (A) Chenab
- (B) Indus
- (C) Neelum
- (D) Tigris

48. Shrimati Droupadi Murmu was recently elected as the 15th President of India. To which State does she belong?

- (A) Chhattisgarh
- (B) Odisha
- (C) Jharkhand
- (D) None of the above

49. Guarantee to an exporter that the importer of his goods will pay immediately for the goods ordered by him, is known as

- (A) letter of credit
- (B) export guarantee

(C) laissez-faire

(D) None of the above

50. Filaria is caused by which of the following?

- (A) Bacteria
- (B) Mosquito
- (C) Protozoa
- (D) Virus

51. Out of all the 2-digit integers between 1 and 100, a 2-digit number has to be selected at random. What is the probability that the selected number is not divisible by 7?

(A) 13/90 (B) 12/90

(C) 78/90 (D) 77/90

52. Find the odd one out in the series of numbers :

6, 9, 15, 21, 24, 28, 30

(A) 21 (B) 30

(C) 28 (D) 15

53. A deck of 5 cards (each carrying a distinct number from 1 to 5) is shuffled thoroughly. Two cards are then removed one at a time from the deck. What is the probability that the two cards are selected with the number on the first card being one higher than the number on the second card?

(A) 1/5

(B) 1/4

(C) 4/25

(D) 2/5

54. Match Column-I with Column-II :

Column—I

Column—II

a. Eradicate

1. Misrepresent

b. Distort

2. Soak completely

c. Saturate

3. Use

d. Utilize

4. Destroy utterly

Select the correct answer using the codes given below.

(A) a b c d
4 1 2 3

(B) a b c d
1 2 3 4

(C) a b c d
2 3 4 1

(D) a b c d
4 1 3 2

55. $(1015)^2 = ?$

(A) 1040125

(B) 1030225

(C) 1050125

(D) 1025125

56. The sum of the ages of 4 children born at interval of 4 years is 36. What is the age of the youngest child?

(A) 2 years

(B) 3 years

(C) 4 years

(D) 5 years

57. Johnny employs 8 workers to work for 6 hours per day. In total he pays them ₹ 630 for a week. How much should Johnny pay 18 workers working 4 hours per day for a week?

- (A) ₹ 945
- (B) ₹ 645
- (C) ₹ 630
- (D) ₹ 1050

58. If a shopkeeper gives 20% discount and then 10% discount on a pen, which has the marked price of ₹ 500, how much would be the selling price of the pen?

- (A) ₹ 350
- (B) ₹ 150
- (C) ₹ 320
- (D) ₹ 360

59. If $3^{2x} = 81$, what is the value of x ?

- (A) 6
- (B) 2
- (C) 4
- (D) 3

60. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 60 questions and secures 130 marks, the number of questions he attempts correctly is

- (A) 35
- (B) 38
- (C) 40
- (D) 42

61. The square root of 64009 is

- (A) 253
- (B) 347
- (C) 363
- (D) 803

Directions : (Q. nos. 62 and 63) Choose the correct alternative from the given ones that will complete the series :

62. 2, 3, 8, 27, 112, ?

- (A) 226
- (B) 339
- (C) 452
- (D) 565

63. AZ, GT, MN, ?, YB

- (A) JH
- (B) SH
- (C) SK
- (D) TS

64. Find the wrong number in the given series

380, 188, 92, 48, 20, 8, 2

- (A) 20
- (B) 92
- (C) 48
- (D) 2

65. Select the one which is different from the other three responses.

- (A) Lake
- (B) River
- (C) Wind
- (D) Current

66. Given $3a + 7b = 72$, where a and b are positive integers. Which of the following can be a possible value of b ?
- (A) 4 (B) 2
(C) 5 (D) 3
67. Which one of the given responses would be a meaningful order of the following?
1. Pupa
 2. Larva
 3. Moth
 4. Egg
- (A) 4, 2, 1, 3
(B) 4, 1, 2, 3
(C) 4, 3, 2, 1
(D) 4, 3, 1, 2
68. If MEAT is written as TEAM, then BALE is written as
- (A) ELAB (B) EABL
(C) EBLA (D) EALB
69. If MADAGASCAR can be written as 4727879670, then MADRAS can be written as
- (A) 472490
(B) 424290
(C) 427409
(D) 472079
70. If A denotes +, B denotes - and C denotes \times , then $(10 \text{ C } 4) \text{ A } (4 \text{ C } 4) \text{ B } 6$ is equal to
- (A) 46 (B) 50
(C) 55 (D) 58
71. Mainak is 14th from the right end in a row of 40 boys. What is his position from the left end?
- (A) 24th (B) 25th
(C) 26th (D) 27th
72. A wholesaler mixes 23 kg of rice at ₹ 24 per kg with 27 kg of rice of other variety at ₹ 37 per kg and sells the mixture at ₹ 35 per kg. What will be his profit margin?
- (A) 12.83% (B) 10.31%
(C) 7.56% (D) 15.32%
73. A mother is twice as old as her son. If 20 years ago, the age of the mother was 10 times the age of the son, what is the present age of the mother?
- (A) 38 years
(B) 40 years
(C) 43 years
(D) 45 years
74. If January 1, 1996 was Monday, what day of the week was January 1, 1997?
- (A) Tuesday
(B) Wednesday
(C) Thursday
(D) Friday
75. What is the compound interest on ₹ 2500 for 2 years at the rate of interest 4% per annum?
- (A) ₹ 180 (B) ₹ 204
(C) ₹ 210 (D) ₹ 220

PART—C : COMPUTER SCIENCE

(Marks : 200)

Each question carries 2 marks

76. If G is a forest with n vertices and k connected components, how many edges does G have?

(A) n/k
(B) $n/2k$
(C) $n - k$
(D) $n - k + 1$

77. Consider the given program :

```
#include<stdio.h>
main()
{
    int i;
    int *pi=&i;
    scanf("%d",pi);
    printf("%d",i=5);
}
```

Which of the following is correct?

(A) Compilation error
(B) Run time error
(C) Output will be $\pi+5$
(D) Output will be $i+5$

78. Consider the equation $(7526)_8 - (Y)_8 = (4364)_8$ where $(X)_N$ stands for X to the base N . Find Y .

(A) 1737
(B) 3142
(C) 3162
(D) 1634

79. Suppose that L_1 is a regular language and L_2 is a context-free language. Which one of the following languages is **not** necessarily context-free?

(A) $L_1 \cap L_2$
(B) $L_1.L_2$
(C) $L_1 - L_2$
(D) $L_1 \cup L_2$

80. Consider the following array :

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 23 | 32 | 45 | 69 | 72 | 73 | 89 | 97 |
|----|----|----|----|----|----|----|----|

Which algorithm out of the following uses the least number of comparisons among the array elements to sort it in ascending order?

(A) Insertion sort
(B) Quicksort using the last element as pivot
(C) Merge sort
(D) Selection sort

81. A binary search tree T contains n distinct elements. What is the time complexity of picking an element in T that is smaller than the maximum element in T ?

(A) $\theta(n \log n)$
(B) $\theta(n)$
(C) $\theta(\log n)$
(D) $\theta(1)$

82. Which of the following standard C library functions will always invoke a system call when executed from a single threaded process in a UNIX/Linux operating system?

- (A) malloc
- (B) exit
- (C) abort
- (D) sin

83. Let $ri(z)$ and $wl(z)$ denote read and write operations respectively on a data item z by a transaction T_i . Consider the following two schedules :

$S1 : r1(x)r1(y)r2(x)r2(y)w2(y)w1(x)$

$S2 : r1(x)r2(x)r2(y)w2(y)r1(y)w1(x)$

- (A) $S1$ is conflict serializable and $S2$ is not conflict serializable
- (B) $S2$ is conflict serializable and $S1$ is not conflict serializable
- (C) Both $S1$ and $S2$ are conflict serializable
- (D) Neither $S1$ nor $S2$ is conflict serializable

84. Consider the following Boolean expression :

$$F = (X + Y + Z)(X' + Y)(Y' + Z)$$

Which of the following Boolean expressions is **not** equivalent to F' which is the complement of F ?

- (A) $XY' + Z'$
- (B) $(X + Z')(Y' + Z')$
- (C) $(X' + Y' + Z')(X + Y')(Y + Z')$
- (D) $XY' + YZ' + X'YZ'$

85. Consider the following C code :

```
a = b + c;
e = a + 1;
d = b + c;
f = d + 1;
g = e + f;
```

In the compiler, this code segment is represented internally as a directed acyclic graph (DAG). The number of nodes in the DAG is

- (A) 6
- (B) 10
- (C) 5
- (D) 7

86. Consider the following statements :

1. Daisy chaining is used to assign priorities in attending interrupts.
2. When a device raises a vectored interrupt, the CPU does polling to identify the source of interrupt.
3. In polling, the CPU periodically checks the status bits to know if any device needs its attention.
4. During DMA, both the CPU and DMA controller can be bus masters at the same time.

Which of the above statements is/are true?

- (A) 1 and 4 only
- (B) 2 and 3 only
- (C) 3 only
- (D) 1 and 3 only

87. The pre-order traversal of a binary search tree is 15, 10, 12, 11, 20, 18, 16, 19. Which one of the following is the post-order traversal of the tree?

- (A) 10, 11, 12, 15, 16, 18, 19, 20
- (B) 20, 19, 18, 16, 15, 12, 11, 10
- (C) 11, 12, 10, 16, 19, 18, 20, 15
- (D) 19, 16, 18, 20, 11, 12, 10, 15

88. Which one of the following regular expressions represents the set of all binary strings with an odd number of 1's?

- (A) $((0+1)^* 1(0+1)^* 1)^* 10^*$
- (B) $(0^* 10^* 10^*)^* 10^*$
- (C) $(0^* 10^* 10^*)^* 0^* 1$
- (D) None of the above

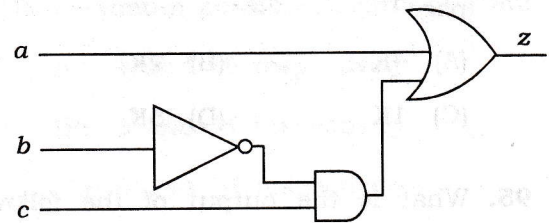
89. Which one of the following is used to represent the supporting many-to-one relationships of a weak entity set in an entity-relationship diagram?

- (A) Diamonds with double/bold border
- (B) Ovals with double/bold border
- (C) Rectangles with double/bold border
- (D) Ovals that contain underlined identifiers

90. If there are m input lines and n output lines for a decoder that is used to uniquely address a byte addressable 1 kb RAM, then the minimum value of $m+n$ is

- (A) 1024
- (B) 1034
- (C) 1000
- (D) 10

91. Consider the following Boolean function $Z(a, b, c)$:



Which of the following minterms list represents the circuit given above?

- (A) $Z = \Sigma(0, 1, 3, 7)$
- (B) $Z = \Sigma(2, 4, 5, 6, 7)$
- (C) $Z = \Sigma(1, 4, 5, 6, 7)$
- (D) $Z = \Sigma(2, 3, 5)$

92. Consider the following C code :

```

int SomeFunction (int x, int y)
{
    if ((x==1) || (y==1)) return 1;
    if (x==y) return x;
    if (x>y) return SomeFunction (x - y, y);
    if (y>x) return SomeFunction (x, y - x);
}
  
```

The value returned by SomeFunction (15,255) is

- (A) 30
- (B) 15
- (C) 225
- (D) 1255

93. Which class of ports does the port number 48151 belong to?

- (A) The well known ports
- (B) Registered ports
- (C) Private ports
- (D) Free ports

94. Assuming a 16-bit address space with 12 logical pages, what is the size of each page?
- (A) 4K (B) 2K
(C) 1K (D) 5K
95. What is the output of the following JAVA code?
- ```
int Integer = 24;
char String = 'I';
System.out.print (Integer);
System.out.print (String);
```
- (A) Compile error  
(B) Throws exception  
(C) I  
(D) 24I
96. FIFO scheduling is a type of
- (A) preemptive scheduling  
(B) deadline scheduling  
(C) non-preemptive scheduling  
(D) None of the above
97. Which of the following follows commutative law but not associative law?
- (A) NAND (B) OR  
(C) AND (D) XOR
98. Wi-Fi is
- (A) simplex  
(B) half-duplex  
(C) full-duplex  
(D) None of the above
99. A relation  $R$  has no composite candidate key. Which of the following is always true for relation  $R$ ?
- (A)  $R$  is in 2NF  
(B)  $R$  is in BCNF  
(C)  $R$  is in 3NF  
(D) Can't be predicted
100. In a compiler, keywords of a language are recognized during
- (A) parsing of the program  
(B) code generation  
(C) lexical analysis of the program  
(D) dataflow analysis
101. Which of the following algorithms is most sensitive to outliers?
- (A) K-means clustering algorithm  
(B) K-medians clustering algorithm  
(C) K-modes clustering algorithm  
(D) K-medoids clustering algorithm
102. The minimum number of  $D$  flip-flops needed to design a mod-258 counter is
- (A) 8  
(B) 9  
(C) 512  
(D) 256

- 103.** Match List-I with List-II and select the correct answer using the codes given below the Lists :

| <i>List-I</i><br>(Fields )      | <i>List-II</i><br>(Length in bits) |
|---------------------------------|------------------------------------|
| a. UDP header's port number     | 1. 48                              |
| b. Ethernet MAC address         | 2. 8                               |
| c. IPv6 next header             | 3. 32                              |
| d. TCP header's sequence number | 4. 16                              |

*Codes :*

- (A) a    b    c    d  
       3    4    2    1  
 (B) a    b    c    d  
       2    1    4    3  
 (C) a    b    c    d  
       4    1    3    2  
 (D) a    b    c    d  
       4    1    2    3

- 104.** Identify the output of the following program :

```
Public class Xerox{
 Public static void main (String args[])
 {
 String str1 = "one";
 String str2 = "two";

 System.out.println (str1.concat(str2));
 }
}
```

- (A) one two        (B) two one  
 (C) Syntax error (D) one
- 105.** What is the minimum number of variables/features required to perform clustering?
- (A) 0                (B) 1  
 (C) 2                (D) 3

- 106.** If  $T$  is a binary search tree with 15 nodes, then the minimum and maximum possible heights of  $T$  are

- (A) 4 and 15 respectively  
 (B) 3 and 14 respectively  
 (C) 4 and 14 respectively  
 (D) 3 and 15 respectively

- 107.** Threads of a process share

- (A) global variable but not heap variable  
 (B) heap variable but not global variable  
 (C) neither global nor heap variable  
 (D) both heap and global variables

- 108.** Consider the following set of processes, the length of the CPU burst time given in millisecond :

| <i>Process</i> | <i>Burst Time</i> |
|----------------|-------------------|
| P1             | 6                 |
| P2             | 8                 |
| P3             | 7                 |
| P4             | 3                 |

Assuming the above process being scheduled with the shortest job first (SJF) scheduling algorithm, then the waiting time for Process P1 is

- (A) 0 ms  
 (B) 16 ms  
 (C) 3 ms  
 (D) 9 ms



**109.** Which of the following is used to allocate and manage resources for a network?

- (A) Server
- (B) Node
- (C) Bluetooth
- (D) Bridge

**110.** The statement  $(\neg p) \rightarrow (\neg q)$  is logically equivalent to which of the statements below?

1.  $p \rightarrow q$
2.  $q \rightarrow p$
3.  $(\neg q) \vee p$
4.  $(\neg p) \vee q$

- (A) 1 only
- (B) 2 and 3 only
- (C) 2 only
- (D) 1 and 4 only

**111.** The representation of the value of a 16-bit unsigned integer  $Z$  in a hexadecimal number system is BCA9. The representation of the value of  $Z$  in octal number system is

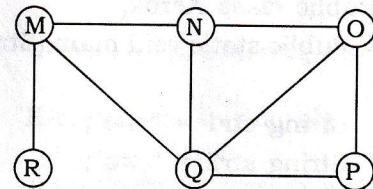
- (A) 571234
- (B) 736251
- (C) 571246
- (D) 136251

**112.** What will be the output of the following JAVA code?

```
class abc
{
 public static void main (String args[])
 {
 if(args.length>0)
 System.out.println(args.length);
 }
}
```

- (A) The code compiles and runs but does not print anything
- (B) The code compiles, runs and prints 0
- (C) The code compiles, runs and prints 1
- (D) The code does not compile

**113.** Breadth-First Search (BFS) has been implemented using queue data structure



Which one of the following is a possible order of visiting the nodes in the graph above?

- (A) NQMPOR
- (B) MNOPQR
- (C) POQNMR
- (D) QMNROP

114. ETL in data warehousing stands for

- (A) extract, transfer and load
- (B) explain, transfer and load
- (C) extract, transform and load
- (D) explain, transform and load

115. Which one of the following algorithms is **not** used in asymmetric key cryptography?

- (A) RSA algorithm
- (B) Deffie-Hellman algorithm
- (C) DSA algorithm
- (D) Electronic code book algorithm

116. Consider a binary code that consists only four valid code words as given below :

00000, 01011, 10101, 11110

Let minimum Hamming distance of code be  $p$  and maximum number of erroneous bits that can be corrected by the code be  $q$ . The values of  $p$  and  $q$  are

- (A)  $p = 4$  and  $q = 1$
- (B)  $p = 3$  and  $q = 1$
- (C)  $p = 4$  and  $q = 2$
- (D)  $p = 3$  and  $q = 2$

117. Given

$$f(w, x, y, z) = \sum_m (0, 1, 2, 3, 7, 8, 10) + \sum_d (5, 6, 11, 15)$$

where  $d$  represents the don't care condition in Karnaugh maps. Which of the following is a minimum product-of-sum (POS) form of  $f(w, x, y, z)$ ?

- (A)  $f = (w' + z')(x' + z)$
- (B)  $f = (w' + z)(x + z)$
- (C)  $f = (w + z)(x' + z)$
- (D)  $f = (w + z')(x' + z)$

118. For a given finite number of instructions to be executed, which architecture of the processor provides for a faster execution?

- (A) ANSA
- (B) Superscalar
- (C) ISA
- (D) All of the above

119. Consider the following C code :

```
#include<stdio.h>
void mystery(int* ptrb, int* ptrb)
{
 int* temp;
 temp = ptrb;
 ptrb = ptrb;
 ptrb = temp;
}
int main()
{
 int a = 2016, b=0, c=4, d=42;
 mystery(&a, &b);
 if (a<c)
 mystery(&c, &a);
 mystery(&a, &d);
 printf("%d", a);
}
```

What will be the output of the code?

- (A) 1
- (B) 0
- (C) 4
- (D) 2016



120. Movie recommendation systems are an example of
1. Classification
  2. Clustering
  3. Reinforcement learning
  4. Regression
- (A) 1, 2, 3  
(B) 1, 2  
(C) 1 only  
(D) 1, 2, 3, 4
121. Which one of the following is the deadlock avoidance algorithm?
- (A) Elevator algorithm  
(B) Round-robin algorithm  
(C) Banker's algorithm  
(D) Karn's algorithm
122. Which one of the following protocols is **not** used to resolve one form of address to another one?
- (A) DHCP (B) DNS  
(C) ARP (D) RARP
123. The number successful accesses to memory stated as a fraction is called as
- (A) access rate  
(B) hit rate  
(C) success rate  
(D) miss rate
124. The \_\_\_\_\_ cipher reorders the plaintext characters to create a ciphertext.
- (A) transposition  
(B) substitution  
(C) Both (A) and (B)  
(D) Neither (A) nor (B)
125. Which term is used to define the multidimensional model of a data warehouse?
- (A) Tree  
(B) Data structure  
(C) Data cube  
(D) Table
126. Which command is used for displaying the contents of a file in Unix?
- (A) mkdir  
(B) cat  
(C) rm  
(D) cp
127. In which one of the following page replacement algorithms, it is possible for the page fault rate to increase even when the number of allocated frames increases?
- (A) LRU (Least Recently Used)  
(B) MRU (Most Recently Used)  
(C) OPT (Optimal Page Replacement)  
(D) FIFO (First In, First Out)
128. Consider the following languages :
- $$L1 = \{a^n b^m c^n : m, n \geq 1\}$$
- $$L2 = \{a^n b^n c^{2n} : n \geq 1\}$$
- Which one of the following is true?
- (A)  $L1$  is context-free while  $L2$  is not  
(B) Both  $L1$  and  $L2$  are context-free  
(C)  $L2$  is context-free while  $L1$  is not  
(D) Neither  $L1$  nor  $L2$  is context-free

129. Consider the following processes, with the arrival time and the length of the CPU burst given in millisecond. The scheduling algorithm used is preemptive shortest remaining-time first :

| Process | Arrival Time | Burst Time |
|---------|--------------|------------|
| P1      | 0            | 10         |
| P2      | 3            | 6          |
| P3      | 7            | 1          |
| P4      | 8            | 3          |

The average turnaround time of these processes is \_\_\_\_ ms.

- (A) 7.50  
(B) 4.25  
(C) 8.25  
(D) 6.50
130. Which one of the following grammars is free from left recursion?

- $S \rightarrow AB$   
 $A \rightarrow Aa \mid b$   
 $B \rightarrow c$
- $S \rightarrow Ab \mid Bb \mid c$   
 $A \rightarrow Bd \mid \epsilon$   
 $B \rightarrow c$
- $S \rightarrow Aa \mid B$   
 $A \rightarrow Bb \mid Sc \mid \epsilon$   
 $B \rightarrow d$
- $S \rightarrow Aa \mid Bb \mid c$   
 $A \rightarrow Bd \mid \epsilon$   
 $B \rightarrow Ac \mid \epsilon$

- (A) 1  
(B) 2  
(C) 3  
(D) 4

131. Where does the system store parameters and local variables whenever a method is invoked?

- (A) Stack (B) Heap  
(C) Tree (D) Array

132. Match List-I with List-II and select the correct answer using the codes given below the Lists :

List-I

List-II

- |                                   |                        |
|-----------------------------------|------------------------|
| a. Condition coverage             | 1. System testing      |
| b. Equivalence class partitioning | 2. Black-box testing   |
| c. Alpha testing                  | 3. Performance testing |
| d. Volume testing                 | 4. White-box testing   |

Codes :

- |     |   |   |   |   |
|-----|---|---|---|---|
| (A) | a | b | c | d |
|     | 1 | 3 | 2 | 4 |
| (B) | a | b | c | d |
|     | 2 | 1 | 3 | 4 |
| (C) | a | b | c | d |
|     | 4 | 2 | 3 | 1 |
| (D) | a | b | c | d |
|     | 4 | 2 | 1 | 3 |

133. SELECT operation in SQL is equivalent to

- (A) the projection operation in relational algebra  
(B) the selection operation in relational algebra  
(C) the selection operation in relational algebra except that SELECT in SQL retains duplicates  
(D) the projection operation in relational algebra except that SELECT in SQL retains duplicates



134. Consider a system with byte-addressable memory, 32-bit logical addresses, 4 kilobyte page size and page table entries of 4 bytes each. The size of the page table in the system in megabyte is

- (A) 4 (B) 2  
(C) 16 (D) 8

135. Bill Inman has estimated that \_\_\_\_\_ of the time required to build a data warehouse, is consumed in the conversion process.

- (A) 10% (B) 20%  
(C) 40% (D) 80%

136. In one of the pairs of protocols given below, both the protocols can use multiple TCP connections between the same client and the server. Which one is that?

- (A) HTTP, TELNET  
(B) SMTP, FTP  
(C) HTTP, FTP  
(D) HTTP, SMTP

137. Consider a 4-bit Johnson counter with an initial value of 0000. The counting sequence of this counter is

- (A) 0, 1, 3, 7, 15, 14, 12, 8, 0  
(B) 0, 8, 12, 14, 15, 7, 3, 1, 0  
(C) 0, 2, 4, 6, 8, 10, 12, 14, 0  
(D) 0, 1, 3, 5, 7, 9, 11, 13, 15, 0

138. Record cannot be updated in

- (A) OLTP  
(B) files  
(C) RDBMS  
(D) data warehouse

139. A file is organized so that the ordering of data records is the same as or close to the ordering of data entries in some index. Then that index is called

- (A) unclustered  
(B) sparse  
(C) dense  
(D) clustered

140. The height of a tree is the length of the longest root-to-leaf path in it. The maximum and minimum numbers of nodes in a binary tree of height 5 are

- (A) 63 and 6 respectively  
(B) 32 and 5 respectively  
(C) 31 and 5 respectively  
(D) 64 and 6 respectively

141. Which one of the following is true about the binary operator # ?

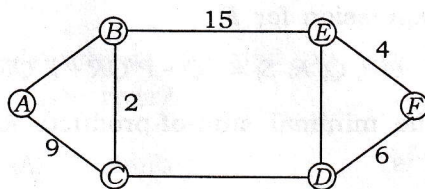
| $P$ | $Q$ | $P \# Q$ |
|-----|-----|----------|
| 0   | 0   | 0        |
| 0   | 1   | 1        |
| 1   | 0   | 1        |
| 1   | 1   | 0        |

- (A) Commutative  
(B) Associative  
(C) Both commutative and associative  
(D) Neither commutative nor associative

**142.** Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given : 45, 20, 90, 10, 50, 60, 80, 25, 70. Assume that the initial position of the R/W head is on track 50. The additional distance that will be traversed by the R/W head when the Shortest Seek Time First (SSTF) algorithm is used compared to the SCAN (elevator) algorithm (assuming that SCAN algorithm moves towards 100 when it starts execution) is \_\_\_\_\_ tracks.

- (A) 11 (B) 7  
(C) 10 (D) 6

**143.** The graph shown below has 8 edges with distinct integer edge weights. The minimum spanning tree (MST) is of weight 36 and contains the edges  $\{(A, C), (B, C), (B, E), (E, F), (D, F)\}$ . The edge weights of only those edges which are in the MST are given in the figure shown below. The minimum possible sum of weights of all 8 edges of this graph is



- (A) 68 (B) 65  
(C) 71 (D) 69

**144.** Let  $a_n$  represent the number of bit strings of length  $n$  containing two consecutive 1s. What is the recurrence relation for  $a_n$ ?

- (A)  $a_{n-2} + a_{n-1} + 2^{n-2}$   
(B)  $2a_{n-2} + a_{n-1} + 2^{n-2}$   
(C)  $a_{n-2} + 2a_{n-1} + 2^{n-2}$   
(D)  $a_{n-2} + 3a_{n-1} + 2^{n-2}$

**145.** Consider a max heap, represented by the array : 40, 30, 20, 10, 15, 16, 17, 8, 4. Now consider that a value 35 is inserted into this heap. After insertion, the new heap is

- (A) 40, 30, 20, 10, 15, 16, 17, 8, 4, 35  
(B) 40, 35, 20, 10, 30, 16, 17, 8, 4, 15  
(C) 40, 20, 30, 10, 16, 17, 4, 8, 15, 35  
(D) 40, 30, 20, 10, 35, 15, 16, 17, 8, 4

**146.** Which is needed by K-means clustering?

- (A) Defined distance metric  
(B) Number of clusters  
(C) Initial guess as to cluster centroids  
(D) All of the above

**147.** 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) 8  
(B) 7  
(C) 10  
(D) 9



148.

Students

| Roll_No. | Student_Name |
|----------|--------------|
| 1        | Raj          |
| 2        | Rohit        |
| 3        | Raj          |

Performance

| Roll_No | Course  | Marks |
|---------|---------|-------|
| 1       | Math    | 80    |
| 1       | English | 70    |
| 2       | Math    | 75    |
| 3       | English | 80    |
| 2       | Physics | 65    |
| 3       | Math    | 80    |

Consider the following relation :

SELECT S. Student\_Name, sum (P. Marks) FROM Student S, Performance P  
WHERE S. Roll\_No = P. Roll\_No  
GROUP by S. Student\_Name

The number of rows that will be returned by the SQL query is

- (A) 2 (B) 1  
(C) 0 (D) 3

149. Consider a main memory with five page frames and the following sequence of page references : 3, 8, 2, 3, 9, 1, 6, 3, 8, 9, 3, 6, 2, 1, 3. Which one of the following is true with respect to page replacement policies First In, First Out (FIFO) and Least Recently Used (LRU)?

- (A) FIFO incurs 2 more page faults than LRU  
(B) LRU incurs 2 more page faults than FIFO  
(C) Both incur the same number of page faults  
(D) LRU incurs 1 more page fault than FIFO

150. Let  $G$  be a connected planar graph with 10 vertices. If the number of edges on each face is three, then the number of edges in  $G$  is

- (A) 21 (B) 24  
(C) 32 (D) 22

151. The least number of temporary variables required to create a three-address code in static single assignment form for the expression  $q + r / 3 + s - t * 5 + u * v / w$  is

- (A) 5 (B) 4  
(C) 7 (D) 8

152. Consider the statement :

"Not all that glitters is gold."  
Predicate glitters ( $x$ ) is true if  $x$  glitters and predicate gold ( $x$ ) is true if  $x$  is gold. Which one of the following logical formulae represents the above statement?

- (A)  $\forall x : \text{glitters}(x) \Rightarrow \sim \text{gold}(x)$   
(B)  $\exists x : \text{gold}(x) \wedge \sim \text{glitters}(x)$   
(C)  $\exists x : \text{glitters}(x) \wedge \sim \text{gold}(x)$   
(D)  $\forall x : \text{gold}(x) \Rightarrow \sim \text{glitters}(x)$

153. Consider the following Boolean expression for  $F$  :

$$F(P, Q, R, S) = PQ + P'QR + P'QR'S$$

The minimal sum-of-products form of  $F$  is

- (A)  $P + Q + R + S$   
(B)  $PQ + QR + QS$   
(C)  $P'R + Q'S$   
(D)  $P' + Q' + R' + S'$

154. The star schema is composed of \_\_\_\_\_ fact table.

- (A) one
- (B) two
- (C) three
- (D) four

155. Match List-I with List-II and select the correct answer using the codes given below the Lists :

| List-I                                  | List-II                                               |
|-----------------------------------------|-------------------------------------------------------|
| a. Waterfall model                      | 1. Specifications can be developed incrementally      |
| b. Evolutionary model                   | 2. Requirements compromises are inevitable            |
| c. Component based software engineering | 3. Explicit recognition of risk                       |
| d. Spiral development                   | 4. Inflexible partitioning of the project into stages |

Codes :

(A) a    b    c    d  
      1    2    3    4

(B) a    b    c    d  
      4    1    2    3

(C) a    b    c    d  
      4    2    1    3

(D) a    b    c    d  
      3    1    2    4

156. The left-hand side of an association rule is called as \_\_\_\_\_

- (A) consequent
- (B) onset
- (C) antecedent
- (D) precedent

157. Consider the relation schema  $R = \{E, F, G, H, I, J, K, L, M, N\}$  and the set of functional dependencies  $\{ \{E, F\} \rightarrow \{G\}, \{F\} \rightarrow \{I, J\}, \{E, H\} \rightarrow \{K, L\}, K \rightarrow \{M\}, L \rightarrow \{N\} \}$  on  $R$ . What is the key for  $R$ ?

- (A)  $\{E\}$
- (B)  $\{E, F, H\}$
- (C)  $\{E, F, H, K, L\}$
- (D)  $\{E, F\}$

158. Which of the following are used to generate a message digest by the network security protocols?

1. RSA
  2. SHA-1
  3. DES
  4. MD5
- (A) 2 and 3 only
  - (B) 1 and 3 only
  - (C) 2 and 4 only
  - (D) 4 and 3 only



**159.** Identify the correct order in which the following actions take place in an interaction between a web browser and a web server :

1. The web browser requests a web-page using HTTP.
2. The web browser establishes a TCP connection with the web server.
3. The web server sends the requested webpage using HTTP.
4. The web browser resolves the domain name using DNS.

- (A) 1, 2, 3, 4  
(B) 4, 1, 2, 3  
(C) 2, 4, 1, 3  
(D) 4, 2, 1, 3

**160.** Assume that there are 3 page frames which are initially empty. If the page reference string is 1, 2, 3, 4, 2, 1, 5, 3, 2, 4, 6, the number of page faults using the optimal replacement policy is

- (A) 7  
(B) 5  
(C) 6  
(D) 8

**161.** The minimum number of comparisons required to find the minimum and the maximum of 100 numbers is

- (A) 146  
(B) 148  
(C) 140  
(D) 147

**162.** Consider the function func shown below :

```
int func(int num)
{
 int count = 0;
 while (num)
 {
 count++;
 num>>=1;
 }
 return (count);
}
```

The value returned by func (435) is

- (A) 11  
(B) 10  
(C) 8  
(D) 9

**163.** Which of the following is false?

- (A) Kernel-level threads cannot share the code segment.  
(B) User-level threads are not scheduled by the kernel.  
(C) When a user-level thread is blocked, all other threads of its process are blocked.  
(D) Context switching between user-level threads is faster than context switching between kernel-level threads.

164. The base (or radix) of the number system such that the equation

$$312/20 = 13.1$$

holds is

- (A) 3
  - (B) 6
  - (C) 4
  - (D) 5
165. If  $T$  consists of 500000 transactions, 20000 transactions contain bread, 30000 transactions contain jam, 10000 transactions contain both bread and jam, then the support of bread and jam is

- (A) 2%
- (B) 3%
- (C) 20%
- (D) 30%

166. Which one of the following fields of an IP header is **not** modified by a typical IP router?

- (A) Time to live (TTL)
- (B) Length
- (C) Source address
- (D) Checksum

167. Which command is used to terminate all processes in your own system except the login shell?

- (A) Cancel 1
- (B) Cancel all
- (C) Kill 1
- (D) Kill 0

168. TCP/IP model does **not** have which layer?

- (A) Transport
- (B) Application
- (C) Session
- (D) Network

169. Classification rules are extracted from

- (A) root node
- (B) leaves
- (C) decision tree
- (D) branches



170. Which of the following is **not** a super-key in a relational schema with attributes V, W, X, Y, Z and primary key V Y?

- (A) VXYZ
- (B) VWXZ
- (C) VWXY
- (D) VWXYZ

171. Which command is used to remove a relation from an SQL?

- (A) Delete
- (B) Purge
- (C) Remove
- (D) Drop table

172. Which combination of the integer variables  $x$ ,  $y$  and  $z$  makes the variable  $a$  get the value 4 in the following expression?

$$a = (x > y) ? ((x > z) ? x : z) : ((y > z) ? y : z)$$

- (A)  $x = 2, y = 4, z = 2$
- (B)  $x = 1, y = 3, z = 4$
- (C)  $x = 3, y = 4, z = 2$
- (D)  $x = 6, y = 3, z = 5$

173. Which of the following system calls results in the sending of SYN packets?

- (A) Connect
- (B) Socket
- (C) Bind
- (D) Listen

174. Which of the following is **not** desired in a good Software Requirement Specifications (SRS) document?

- (A) Functional Requirements
- (B) Goals of Implementation
- (C) Algorithms for Software Implementation
- (D) Non-Functional Requirements

175. \_\_\_\_ is a subject-oriented, integrated, time-variant, non-volatile collection of data in support of management decisions.

- (A) Data mining
- (B) Data warehousing
- (C) Text mining
- (D) Web mining