N-8

Booklet Code: A

ENTRANCE EXAMINATION – 2017

Master of Computer Applications (MCA)

Time: 2 Hours

Max. Marks: 100

Hall Ticket Number:

INSTRUCTIONS

1. (a) Write your Hall Ticket Number in the above box AND on the OMR Sheet.
   (b) Fill in the OMR Sheet, the **Booklet Code** given above at the top left corner of this sheet. Candidates should also read and follow the other instructions given in the OMR sheet.
2. All answers should be marked clearly in the OMR answer sheet only.
3. This objective type test has two parts: **Part A** with **25** questions and **Part B** with **50** questions. Please make sure that all the questions are clearly printed in your paper.
4. **There is negative marking.** Every correct answer in **Part A** carries **2 (two)** marks and for every wrong answer **0.66 marks will be deducted.** Every correct answer in **Part B** carries **1 (one) mark** and for every wrong answer **0.33 marks will be deducted.**
5. Do not use any other paper, envelope etc. for writing or doing rough work. All the rough work should be done in your question paper or on the sheets provided with the question paper at the end.
6. Use of non-programmable calculators and log-tables is allowed.
7. Use of mobile phone is NOT allowed inside the hall.
8. Hand over the **OMR answer sheet** at the end of the examination to the Invigilator.

PART – A

1. a, b, c are three consecutive integers. If $c^2 - a^2 = 100$, then

   A. a, b, c are all composite numbers

   B. a, c are twin primes

   C. b is a prime number

   D. None of the above

2. In the multiplication,

   $$\mathrm{ON} \times \mathrm{ON} = \mathrm{MOON}$$

   each letter stands for a unique digit from '0' to '9'. What digit is 'O'?

   A. 4

   B. 5

   C. 6

   D. 7

3. A die has three '1's, two '2's and one '5' on its six faces. What is the mean value of the numbers obtained if the die is thrown a large number of times?

   A. 3.5

   B. 3

   C. 2

   D. 1.5

4. 48 coins are divided into three unequal heaps. If as many coins are taken from the first heap and added to the second heap and as many there are in the third are taken from the second and added to the third heap, and as many there are in the first are taken from the third and added to the first, all the heaps would be having equal number of coins. How many were there in each heap originally?

   A. 20, 18, 12

   B. 22, 14, 12

   C. 20, 28, 10

   D. 18, 22, 8

5. An eight-toothed wheel is coupled with a 24-toothed wheel. How many times will the small wheel rotate on its axis to circle around the big wheel?

   A. 2

   B. 3

   C. 4

   D. 6

6. Two workers X and Y living in the same house and working in the same office reach the office in 30 minutes and 20 minutes respectively. If Y starts 5 minutes later than X, when would he catch up X?

   A. in 10 minutes

   B. in 12 minutes

   C. in 8 minutes

   D. None of the above

7. 40 cows can eat grass in a field in 40 days and 30 cows can eat the grass in 60 days. In how many days can 20 cows eat all the grass in the field?

   A. 60

   B. 80

   C. 120

   D. 150

8. There are five books A, B, C, D and E placed on a table. If A is placed below E, C is placed above D, B is placed below A and D is placed above E, then which of the following books touches the surface of the table?

   A. C

   B. B

   C. A

   D. E

9. The hour and minute hands of a clock meet every 65 minutes. As compared to a normal clock that keeps correct time, this clock

   A. gains 5 minutes every 11 hours

B. loses 5 minutes every 11 hours

C. gains 11 minutes every 5 hours

D. loses 11 minutes every 5 hours

10. If FRIEND is coded as HUMJTK, CANDLE is coded as

A. DEQJQM

B. EDRIRL

C. DCQHOK

D. ESJFME

11. If A is the son of Q, Q and Y are sisters, Z is the mother of Y, P is the son of Z, then which of the following statements is correct?

A. P is the maternal uncle of A

B. P and Y are sisters

C. A and P are cousins

D. Q is the mother of Z

12. You are taking a multiple-choice test for which you have mastered 70% of the course material. Assume this means that you have a 0.7 chance of knowing the answer to a random test question, and that if you don't know the answer to a question then you randomly select among the four answer choices. Assume that all choices are uniformly distributed. If there are 50 questions in total, what is your expected score (as a percent) on the exam?

A. 70

B. 75

C. 77.5

D. 82.5

13. Three ladies X, Y and Z marry three men A, B and C. X is married to A, Y is not married to an engineer, Z is not married to a doctor, C is not a doctor and A is a lawyer. Then which of the following statements is correct?

A. Y is married to C who is an engineer

B. Z is married to C who is a doctor

C. X is married to a doctor

D. None of the above

14. In the current western calendar system, which of the following years' calendar will be a repeat of this year's (i.e., all the weekdays match)? E.g. if 2/6/17 is a Friday, then 2 June in that year will also be a Friday.

A. 2023

B. 2025

C. 2030

D. 2036

15. If $\sqrt{ATOM} = A + TO + M$, what is 'TO'? Each letter stands uniquely for a digit between 0 and 9.

A. 20

B. 29

C. 36

D. 52

16. A physicist, who is in a hurry, walks up an upward moving escalator at the rate of one step per second. 20 steps brings him to the top. Next day, he goes at two steps per second reaching the top in 32 steps. How many steps are there in the escalator?

A. 40

B. 80

C. 120

D. 140

17. A's age is the sum of B's age and the cube root of C's age. B's age is the sum of C's age, cube root of A's age plus 14. C's age is the sum of cube root of A's age and square root of B's age. What is B's age?

A. 27 years

B. 49 years

C. 64 years

D. 81 years

18. Karim and Kausar have only one camel to ride between them. Karim rides the camel for sometime, then ties it to a shrub for Kausar and then continues on the journey by walk. When Kausar reaches the camel, she rides the camel for sometime and then ties it to any convenient object and proceeds by walk. They proceed this way alternately walking and riding. If they walk at 4 Kmph and ride at 12 Kmph, for what part of the time of the journey is the camel resting?

    A. one-fourth of the time

    B. one-third of the time

    C. half of the time

    D. sixty percent of the time

19. Two trains – one travelling from Station A to Station B, and the other from Station B to Station A – leave their respective stations at the same time. The first arrives at its destination 1hr after the two trains meet and the second reaches its destination 2 hrs 15 minutes after they meet. Which of the following statements is true?

    A. The first train is twice as fast as the second

    B. The first train is 1.5 times faster than the second

    C. The first train is 2.25 times faster than the second

    D. None of the above

20. Two people were going from Town A to Town B. After sometime, one asked the other, "How much have we travelled?" and the other answered, "half the distance yet to go." After another 2 Km, the first asked the second traveller, "How much further do we have to go?" and the second answered, "half the distance we already travelled." What is the distance between A and B?

    A. 8 Km

    B. 12 Km

    C. 6 Km

    D. 10 Km

21. Two ships of equal length ℓ are moving in opposite directions with speeds u and v Kmph respectively. If it takes them t seconds to cross each other, then ℓ (in metres) is

    A. $\frac{18}{5}(u+v)t$

    B. $\frac{5t(u+v)}{36}$

    C. $\frac{5t(u+v)}{18}$

    D. None of the above

22. A pack of playing cards is separated into Red and Black colours and then put into three piles.

    Pile 1: Contains three times as many blacks as reds.

    Pile 2: Contains three times as many reds as blacks.

    Pile 3: Contains twice as many blacks as reds.

    How many Red and Black cards are there in each pile?

    A. Pile 1: 12 blacks, 4 reds; Pile 2: 6 blacks, 18 reds; Pile 3: 8 blacks, 4 reds

    B. Pile 1: 6 blacks, 2 reds; Pile 2: 8 blacks, 24 reds; Pile 3: 4 blacks, 2 reds

    C. Pile 1: 18 blacks, 6 reds; Pile 2: 5 blacks, 15 reds; Pile 3: 4 blacks, 2 reds

    D. None of the above

23. A mathematician observed the four digit number portion of the licence plate of a speeding car. He said that the first three digits formed a perfect square and so did the last three digits. In fact, he said, quite happily, "if you reverse the order of the first three digits, you get the last three." What

is the square root of the last three digits?

A. 11

B. 12

C. 21

D. 31

24. It is found that the perimeter of a right angled triangle is numerically equal to its area. What is more, it is an integer value. Then, hypotenuse of the triangle is

A. 26 units

B. $\sqrt{18}$ units

C. 13 units

D. 5 units

25. Ram was 3 times as old as his sister Maya 2 years ago and 5 times as old 2 years before that. In how many years will the ratio of their ages be 2:1?

A. 1

B. 2

C. 4

D. 8

PART – B

26. Let f, g be functions that map $\mathbb{R} \to \mathbb{R}$ and let function $h = f \circ g$. Which of the following is *not true* about $h(x)$ when $f(x) = \exp(-x)$ and $g(x) = x^2$?

A. h is uniformly continuous

B. definite integral of h for $a, b (b > a)$ exists for all real numbers a, b

C. integral of h has a closed form

D. Function h is differentiable everywhere

27. The derivative of $f(x) = \exp(-|x|)$ at $x = 0$ is

A. $\exp(-|x|)$

B. $\exp(-x)$

C. $-\exp(-|x|)$

D. Derivative does not exist

28. Consider the functions

$$\begin{aligned} f(x) &= \exp(-x) \\ h(x) &= \exp(-x^2) \\ u(x) &= \cos(x) \\ w(x) &= |x^3| \end{aligned}$$

Which of the following is *true* when x is a real number?

A. All the functions f, h, u, w are even functions

B. Only u is an even function

C. Only f is an even function

D. Only w is an even function

29. Let $f(x) = \exp(-x)$ and $u(x) = \cos(x)$; then the left derivative of u and the right derivative of f at $x = 0$ are

A. equal to -1

B. equal to 0

C. 0 and -1

D. 1 and 0

30. If **A** and **B** are symmetric matrices of the same order, then **AB** – **BA** is a

A. Skew symmetric matrix

B. Symmetric matrix

C. Zero matrix

D. Identity matrix

31. If a matrix **A** is both symmetric and skew symmetric, then **A** is a

A. Diagonal matrix

B. Zero matrix

C. Square matrix

D. None of the above

32. If a, b, c are in Arithmetic Progression, then the determinant

$$\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix} =$$

A. 0
B. 1
C. x
D. $2x$

33. Let $\mathbf{A}$ be a square matrix of order 3×3. If $|\cdot|$ indicates determinant, then $|k\mathbf{A}| =$

A. $k|\mathbf{A}|$
B. $k^2|\mathbf{A}|$
C. $k^3|\mathbf{A}|$
D. $3k|\mathbf{A}|$

34. If A, B are two events such that $P(A) \neq 0$ and $P(B|A) = 1$, then

A. $A = \varnothing$
B. $B = \varnothing$
C. $B \subseteq A$
D. $A \subseteq B$

35. A subset B of items is removed from a set of items A and added to another set of items C. If, as a result, the mean value of the items in both sets A and C increases, then

A. $\mu_A < \mu_B < \mu_C$
B. $\mu_C < \mu_B < \mu_A$
C. $\mu_C < \mu_A < \mu_B$
D. None of the above

(μ_A, μ_B and μ_C are the original mean values of items in A, B and C respectively)

36. If $\omega \neq 1$ is a complex cube root of unity and

$$H = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$$

then $H^{2017} =$

A. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
B. $\begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$
C. $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$
D. Zero matrix

37. At $x = \frac{1}{6}$, what is the value of

$$\frac{d^4}{dx^4}(3x^2 - x)$$

A. 0
B. $-\frac{1}{6}$
C. $-\frac{1}{18}$
D. 6

38. In a triangle ΔABC with $\angle C = \frac{\pi}{2}$, if $\tan\frac{A}{2}$ and $\tan\frac{B}{2}$ are roots of the equation $ax^2 + bx + c = 0, a \neq 0$, then

A. $a = b + c$
B. $b = a + c$
C. $c = a + b$
D. $a = b = c$

39. If

$$\mathbf{A} = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$$

and $det(\mathbf{A}^2) = 25$, then

A. $|\alpha| = 5$
B. $\alpha = \sqrt{5}$
C. $\alpha = \sqrt[5]{25}$
D. $|\alpha| = \frac{1}{5}$

40.

$$\int_5^8 \frac{\log x^4}{\log x^2 + \log(13-x)^2}\, dx =$$

A. 3

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B. $\frac{3}{2}$

C. 1

D. $\frac{1}{3}$

41. A bag contains four balls. One is blue, one is white and two are red. Two balls at random are drawn from the bag. If there is a red ball among the two balls drawn out, what is the probability that the other ball drawn out is also red?

A. $\frac{1}{15}$

B. $\frac{1}{10}$

C. $\frac{1}{5}$

D. None of the above

42. Let $\cos(\alpha+\beta) = \frac{4}{5}$ and $\sin(\alpha-\beta) = \frac{5}{13}, 0 \le \alpha, \beta \le \frac{\pi}{4}$, then $\tan 2\alpha =$

A. $\frac{56}{33}$

B. $\frac{19}{12}$

C. $\frac{20}{7}$

D. $\frac{25}{16}$

43. Consider the following statements:

S: $\cos(A) + \cos(B) + \cos(C) = 0$
T: $\sin(A) + \sin(B) + \sin(C) = 0$

If

$$\cos(B-C)+\cos(C-A)+\cos(A-B) = -\frac{3}{2}$$

then

A. S is true, but T is false

B. S is false, but T is true

C. both S and T are true

D. both S and T are false

44. If $\sin^{-1}\frac{x}{5} + \operatorname{cosec}^{-1}\frac{5}{4} = \frac{\pi}{2}$, then $x =$

A. 1

B. 3

C. 5

D. 7

45. If $\cot^{-1}[(\cos\alpha)^{\frac{1}{2}}] + \tan^{-1}[(\cos\alpha)^{\frac{1}{2}}] = x$, then $\sin(x) =$

A. 1

B. $\cot^2(\frac{\alpha}{2})$

C. $\tan\alpha$

D. $\cot(\frac{\alpha}{2})$

46. In the IEEE 754 floating point format, a 64-bit floating point number has a significand of

A. 48 bits

B. 53 bits

C. 54 bits

D. 58 bits

47. The graph of $f(x)$ intersects any line of the form $y = k, |k| \le 100$ only once. Then $f(x)$ is

A. One-to-One function

B. Onto function

C. One-to-One and Onto function

D. Not a function

48. The least negative value that the product of two 8-bit signed 2's complement numbers can have is

A. -2^{16}

B. -2^{15}

C. -2^{14}

D. -2^{12}

49. Number of bytes used for representation of ASCII character in Unicode Transformation Format (UTF-8) is

A. 1

B. 2

C. 3

D. 4

50. Consider the following system of equations

$$\begin{aligned} kx + y - z &= 0 \\ -x + ky + z &= 0 \\ x + ky + z &= 0 \end{aligned}$$

For how many values of k does the system has unique solutions?

A. 4

B. 3

C. 2

D. 1

51. Let $f(x) = (x-2)(8-x), 2 \le x \le 8$. Find $f(f(3))$ and $f(f(5))$.

A. 5 and 9

B. 9 and 5

C. 9 and not defined

D. not defined and not defined

52. In a class of 100 students, at least 90 are good at Physics; at least 80 are good at Maths; and at least 70 are good at Chemistry. At least how many students are good at *all three*?

A. 30

B. 40

C. 60

D. 70

53. If $4\sin^{-1}x + \cos^{-1}x = \pi$, then $x =$

A. 1

B. $\frac{\pi}{2}$

C. $\frac{1}{2}$

D. $\frac{\pi}{6}$

54. The range of

$$f(x) = \frac{x^2}{x^4+1}, \quad x \in \mathbb{R}$$

is

A. $[0, 2]$

B. $[0, \frac{1}{2}]$

C. $(0, \infty)$

D. $(0, \frac{1}{2})$

55. Let $f(x) = \lfloor \tan^2 x \rfloor$, where $\lfloor \cdot \rfloor$ indicates the greatest integer smaller than $\cdot$ function, then

A. $\lim_{x\to 0} f(x)$ does not exist

B. $f(x)$ is continuous at 0

C. $f(x)$ is not differentiable at $x = 0$

D. $f'(0) = 1$

56. Let

$$f(x) = \begin{cases} |x-1| + a & \text{if } x \le 1 \\ 2x + 3 & \text{if } x > 1 \end{cases}$$

If $f(x)$ has a local minimum at $x = 1$, then $a \le$

A. 5

B. -1

C. 0

D. -5

57. Convert the following octal number to binary: 104_8

A. 01000100

B. 01101000

C. 00100100

D. 01000001

58. The 10's complement of 715_8 is

A. 63

B. 285

C. 395

D. 539

59. Which of the following decimal numbers when represented in binary has the smallest number of '1's?

A. 63

B. 224

C. 1020

D. 2079

60. A computer with 32-bit word size uses 2's complement representation for integers. The range of integers that can be represented on this computer is

A. -2^{31} to 2^{31}

B. $-2^{32}-1$ to 2^{32}

C. -2^{31} to $2^{31}-1$

D. -2^{32} to 2^{31}

61. Someone claims to have found a long lost work by Mr. Khuswant Singh. She asks you to decide whether or not the book was actually written by Mr. Khuswant Based on the assumption that all his books have similar word frequencies. You buy a copy of "Train to Pakistan" (B1) written by Mr. Khuswant and count the frequencies of certain common words on some randomly selected pages. You do the same thing for the 'long lost work' (B2). When you perform the test, you get a score of 78.93. For 3 degrees of freedom, Chi-Square value for 0.01 significance level is 6.25. What do you conclude about 'long lost work'?

A. Written by Mr. Khuswant Singh

B. Not Written by Mr. Khuswant Singh

C. Not enough information

D. Chi-square test cannot be used

62. A person gets three chances to throw a '4' and win a game. The probability of winning on the third throw, assuming a fair die, is

A. $\frac{5}{36}$

B. $\frac{25}{216}$

C. $\frac{25}{36}$

D. $\frac{125}{216}$

63. Area of the region bounded by the curve $y = e^x$ and lines $x = 0$ and $y = e$ is

A. $\int_1^e \ln(e+1-y)\, dy$

B. $e - \int_0^1 e^x\, dx$

C. $\int_1^e \ln(y)\, dy$

D. All of the above

64. Suppose a nonhomogeneous system of 15 linear equations in 17 unknowns has a solution for all possible constants on the right side of the equation. Then, the associated system of *homogeneous* linear equations

A. has at most 1 linearly independent solution

B. has at most 2 linearly independent solutions

C. has at most 3 linearly independent solutions

D. None of the above

65. Given a set of $2n+1$, $(n > 10)$ sample measurements of a random variable $\mathbf{X}$,

A. Their mean is always one of the measured values

B. Their median is always one of the measured values

C. Their median is always smaller than the mean

D. None of the above

66. If $\hat{a}, \hat{b}, \hat{c}, \hat{d}$ are unit vectors such that $(\hat{a} \times \hat{b}) \cdot (\hat{c} \times \hat{d}) = 1$ and $\hat{a} \cdot \hat{c} = \frac{1}{2}$, then

A. $\hat{a}, \hat{b}, \hat{c}$ are non-coplanar

B. $\hat{b}, \hat{c}, \hat{d}$ are non-coplanar

C. $\hat{b}, \hat{d}$ are non-parallel

D. $\hat{a}, \hat{d}$ are parallel and $\hat{b}, \hat{d}$ are parallel

67. The mean value of the marks of 90 students in a class was calculated as 32. Later it was found that a student's marks of 61 was misread as 81. What is the correct mean?

A. 32.78

B. 31.78

C. 32.22

D. 31.22

68. If ${}^nC_{r-1} = 36; {}^nC_r = 84; {}^nC_{r+1} = 126$, then $r =$

A. 9

B. 6

C. 5

D. 3

69. Which of the following is a measure of the relative peakedness or flatness of a frequency distribution curve?

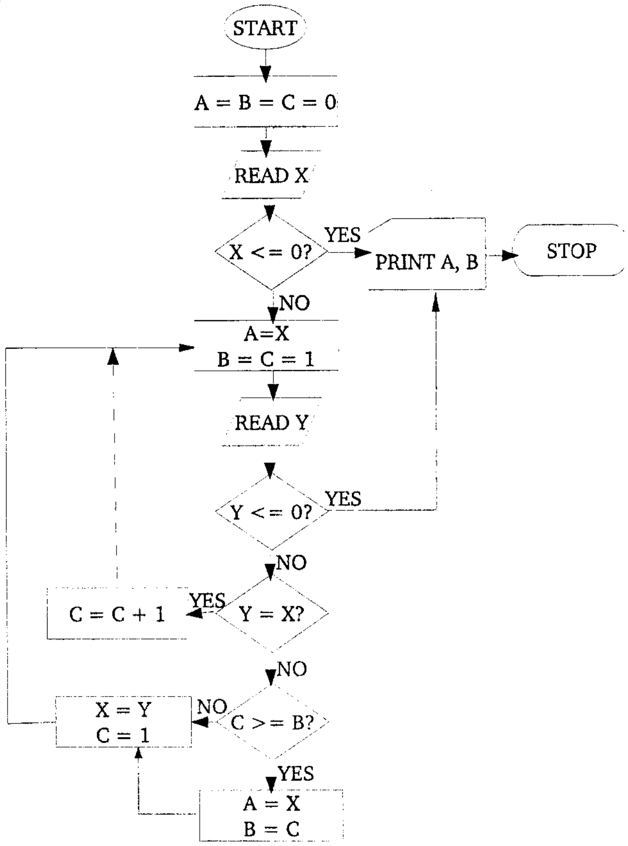
A. Skewness

B. Standard Deviation

C. Kurtosis

D. Median

Questions 70 – 72 are based on the flow-chart given below.



70. Given the input 1 1 3 3 5 7 7 9 11 0, what is the output B?

A. 0

B. 1

C. 3

D. 7

71. If the input contains only one value V repeated N times, what are the outputs A and B?

A. A = V, B = N

B. A = 0, B = 1

C. A = 0, B = N

D. None of the above

72. What computation is represented in the flow-chart?

A. Calculate Frequencies

B. Calculate Mode

C. Calculate Maximum

D. Calculate Minimum

73. A teacher wrote an equation $ax^2 + bx + c = 0$ on the blackboard and asked the students to solve it. A careless student made a small mistake in copying and found out that he got the same roots (α, β) as the rest but with opposite signs. What was his mistake?

    A. Changed the sign of c

    B. Changed the sign of b

    C. Interchanged b and c

    D. Interchanged a and b

74. Let $\mathbf{X} = \{1, 2, 3, \ldots\}$ and let $\mathcal{R}$ be a relation on $\mathbf{X} \times \mathbf{X}$ such that $(x, y)\mathcal{R}(u, v)$ if $xv = yu$. Then $\mathcal{R}$ is

    A. Reflexive and Symmetric but not Transitive

    B. Reflexive and Transitive but not Symmetric

    C. an Equivalence relation

    D. None of the above

75. Let A, B, C be subsets of the universal set U. Let $A \cap B = A \cap C$ and $\bar{A} \cap \bar{B} = \bar{A} \cap \bar{C}$. Then,

    A. $B = C$

    B. $A = C$

    C. $A = B = C$

    D. None of the above