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Time : 1½ Hours

FIRST-TERM**MATHEMATICS &
STATISTICS**

Subject Code

H	4	6	0	6
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Total No. of Questions : 40 (Printed Pages : 16)

Maximum Marks : 40

- INSTRUCTIONS :**
- (i) Every question has four choices A, B, C and D and only one of them is the correct answer.
 - (ii) On the OMR sheet darken completely with a ball point pen **ONLY ONE** bubble you consider as the most appropriate answer.
 - (iii) Multiple markings are invalid.
 - (iv) Use Blue or Black ball point pen only.
 - (v) Do not fold the OMR sheet or use white ink.
 - (vi) For each question, you will be awarded **ONE** mark, if you have darkened only the bubble corresponding to the correct answer. In all other cases, you will get zero mark. **There is no negative mark.**
 - (vii) Once the bubble is filled it is not possible to change the answer.
 - (viii) Only one **OMR** sheet will be provided. Hence sufficient care must be taken while darkening the bubble.

1. Let f, g be real valued function defined as $f(x) = 3x^2 + 5x$ and $g(x) = 2x$. The value of $(f \circ g)_{(2)}$ is

(A) 48

(B) 58

(C) 68

(D) 78

2. A function is said to have removable type of discontinuity at $x = a$ if

(A) $\lim_{x \rightarrow a^-} f(x) \neq f(a) \neq \lim_{x \rightarrow a^+} f(x)$

(B) $\lim_{x \rightarrow a^-} f(x) \neq \lim_{x \rightarrow a^+} f(x)$

(C) $\lim_{x \rightarrow a^-} f(x) = f(a) \neq \lim_{x \rightarrow a^+} f(x)$

(D) $\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x) \neq f(a)$

3. The function $f(x) = \begin{cases} \frac{x^n - 1}{x - 1}, & \text{if } x \neq 1 \\ k, & \text{if } x = 1 \end{cases}$ is continuous at $x = 1$, then the value of k is

(A) n

(B) 1

(C) -1

(D) $-n$

4. If $y = \frac{2\sqrt{x}}{3}$, then $\frac{dy}{dx}$ at $x = 1$ is
- (A) $3/2$
(B) $2/3$
(C) $+1/3$
(D) 3
5. If $f(x) = \frac{x^2 + 4x - 5}{x - 1}$; $x \neq 1$ is continuous at $x = 1$, then $f(1)$ is
- (A) 10
(B) 8
(C) 6
(D) 4
6. A square matrix is invertible i.e. A^{-1} exist if and only if matrix A is
- (A) Singular matrix
(B) Skew-symmetric matrix
(C) Non-singular matrix
(D) Symmetric matrix
7. The derivative of 8^x with respect to x is
- (A) $\frac{8^x}{\log 8}$
(B) 8^x
(C) $8^x \log x$
(D) $8^x \log 8$

8. If $y = 7 + 2x \log x$, then $\frac{d^2y}{dx^2}$ is

(A) $\frac{2}{y}$

(B) $\frac{2}{x}$

(C) $\frac{-2}{x}$

(D) $-\frac{2}{y}$

9. For $A = \begin{bmatrix} 2 & 6 & 8 \\ 5 & 3 & 8 \\ 11 & 9 & 7 \end{bmatrix}$, $(A)'$ =

(A) A'

(B) Zero matrix

(C) A

(D) Identity matrix

10. Matrix $A = \begin{bmatrix} 0 & -2 & 3 \\ 2 & 0 & 1 \\ x & -1 & 0 \end{bmatrix}$ is skew-symmetric matrix, then the value of

x is

(A) -3

(B) -2

(C) -1

(D) 0

11. Matrix $\begin{bmatrix} 7 & 1 \\ 2 & \lambda \end{bmatrix}$ is a singular matrix, then the value of λ is

(A) $\frac{2}{7}$

(B) $\frac{7}{2}$

(C) $\frac{-2}{7}$

(D) $\frac{-7}{2}$

12. If $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$, then the value of x is

(A) 1

(B) 2

(C) 3

(D) 4

13. Let $*$ be a binary operation on the Q_0 , set of all non-zero rational numbers defined by $a*b = \frac{2ab}{3} \forall a, b \in Q_0$, then identity element in Q_0 is

(A) $\frac{3}{2}$

(B) $\frac{-3}{2}$

(C) $\frac{2}{3}$

(D) $\frac{-2}{3}$

14. If $x^x = y$, then $\frac{dy}{dx} = \dots\dots\dots$
- (A) $y(1 + \log x)$
- (B) $(1 + \log x)$
- (C) $x^x(\log x + x)$
- (D) $(\log x + x)$
15. If $A = \begin{bmatrix} 3 & 2 \\ -7 & -1 \end{bmatrix}$, then Adjoint of A is $\dots\dots\dots$
- (A) $\begin{bmatrix} -1 & -2 \\ 7 & 3 \end{bmatrix}$
- (B) $\begin{bmatrix} -3 & 2 \\ 7 & 1 \end{bmatrix}$
- (C) $\begin{bmatrix} -7 & -1 \\ 3 & 2 \end{bmatrix}$
- (D) $\begin{bmatrix} 2 & 3 \\ -1 & -7 \end{bmatrix}$
16. If R is a relation defined on Z, the set of all integers given by $R = \{(x, y) : x - y \text{ is multiple of } 5\}$, then R is $\dots\dots\dots$
- (A) Reflexive and Symmetric
- (B) Symmetric and Transitive
- (C) Reflexive and Transitive
- (D) An Equivalence Relation

17. The function $f(x) = \begin{cases} \frac{2x+3\sin x}{3x+2\sin x}, & x \neq 0 \\ 4k, & x = 0 \end{cases}$ is continuous at $x = 0$, then the

value of k is

- (A) 4
- (B) 1
- (C) -1
- (D) $\frac{1}{4}$

18. If $\begin{bmatrix} 2 & -3 \\ 4 & -2 \end{bmatrix} - X = \begin{bmatrix} -3 & 4 \\ 5 & -1 \end{bmatrix}$, then matrix $X = \dots\dots\dots$

- (A) $\begin{bmatrix} 5 & -7 \\ -1 & -1 \end{bmatrix}$
- (B) $\begin{bmatrix} 5 & 7 \\ 1 & -1 \end{bmatrix}$
- (C) $\begin{bmatrix} -5 & -7 \\ -1 & 1 \end{bmatrix}$
- (D) $\begin{bmatrix} 5 & -1 \\ 7 & -1 \end{bmatrix}$

19. For matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$, the co-factor of -2 is

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

20. If $\sqrt{x} - \sqrt{y} = 5$, then $\frac{dy}{dx} = \dots\dots\dots$

(A) $\sqrt{\frac{x}{y}}$

(B) $-\sqrt{\frac{x}{y}}$

(C) $\sqrt{\frac{y}{x}}$

(D) $-\sqrt{\frac{y}{x}}$

21. The matrix $A = [a_{ij}]$ of order 2×2 , where elements are given by $a_{ij} = \frac{i+j}{j}$ is $\dots\dots\dots$

(A) $\begin{bmatrix} -2 & 3/2 \\ 3 & -2 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & 3/2 \\ 3 & 2 \end{bmatrix}$

(C) $\begin{bmatrix} 3/2 & 2 \\ 2 & 3 \end{bmatrix}$

(D) $\begin{bmatrix} 2 & -3/2 \\ -3 & 2 \end{bmatrix}$

22. If two rows (or columns) of a determinant are identical, then the value of the determinant is $\dots\dots\dots$

(A) 0

(B) 1

(C) 2

(D) 3

23. If $x = at^2$, $y = 2at$, then $\frac{dy}{dx}$ at $t = 1$ is
- (A) 1
(B) 2
(C) 3
(D) 4
24. The instantaneous rate of change of total cost at any level of output is called
- (A) Marginal cost
(B) Average cost
(C) Total cost
(D) None of the above
25. The binary operation $*$ on Q defined by $a * b = a + b + ab$ for $a, b \in Q$. Set of all rational numbers, then the value of $2 * 3$ is
- (A) 10
(B) 11
(C) 12
(D) 13
26. The amount of the interest on the face value charged by banker or bill broker, in order to make cash payment before the maturity of the bill against its holding is called
- (A) True Discount
(B) Banker's Discount
(C) Banker's Gain
(D) Present Value

27. In a partnership deed, on admission of a new partner the premium for goodwill brought by the new partner is shared among old partners in
- (A) New profit sharing ratio
 - (B) Gaining ratio
 - (C) Old profit sharing ratio
 - (D) Sacrificing ratio
28. Harpreet and Manpreet invested Rs. 10,000 and Rs. 5,000 in a partnership business. Each partner is to receive 6% on the capital invested. If the total profit after a year was Rs. 12,000. The net profit of that year is
- (A) Rs. 11,000
 - (B) Rs. 11,100
 - (C) Rs. 11,200
 - (D) Rs. 11,300
29. If Heena and Leena are partners and invested Rs. 1,260 and Rs. 840 respectively, then the share of Heena in a profit of Rs. 1,210 after a year is
- (A) Rs. 8,480
 - (B) Rs. 7,260
 - (C) Rs. 726
 - (D) Rs. 121

30. The difference between Total Revenue and Total Cost is called
- (A) Break-even point
 - (B) Profit
 - (C) Marginal Revenue
 - (D) Average Cost
31. The revenue function is $21x - \frac{3}{2}x^2$. Where x is the number of units demanded, then number of units demanded to receive maximum revenue.
- (A) 5
 - (B) 6
 - (C) 7
 - (D) 8
32. The manufacturing cost of an item consists of Rs. 900 as overheads, the material cost Rs. 3 per item and labour cost is Rs. $\frac{x^2}{10}$ for x items produced. Then the total cost for 10 items produced is
- (A) Rs. 640
 - (B) Rs. 740
 - (C) Rs. 840
 - (D) Rs. 940

33. A bill of Rs. 10,00,000 due 10 months hence discounted now at a simple interest of 6% p.a., then banker's discount on a bill of exchange is
- (A) Rs. 40,000
(B) Rs. 50,000
(C) Rs. 60,000
(D) Rs. 70,000
34. The banker's discount and banker's gain on a certain bill of exchange is due after certain time are Rs. 1,150 and Rs. 50 respectively, then the true discount is
- (A) Rs. 1,300
(B) Rs. 1,200
(C) Rs. 1,100
(D) Rs. 1,000
35. Amit and Sumit contribute as capital Rs. 40,000 and Rs. 35,000 respectively. Amit is paid honorarium of Rs. 1,000 per month for one year and profit share Rs. 8,000. Sumit is paid goodwill amount of Rs. 5,000 fixed and profit share Rs. 10,000. The present worth of Amit is
- (A) Rs. 40,000
(B) Rs. 50,000
(C) Rs. 60,000
(D) Rs. 70,000

36. The revenue function for a certain product is represented by the equation $20x + 5x^2 - 3x^3$ where x is the number of units demanded. Then the marginal revenue when 2 units are sold is
- (A) Rs. 2
(B) Rs. 4
(C) Rs. 6
(D) Rs. 8
37. The cost of producing and marketing x units of a certain product is given by $c = 3x^2 + 10x + 600$, then its Average Cost when 10 units produced is
- (A) Rs. 4,000
(B) Rs. 3,000
(C) Rs. 2,000
(D) Rs. 1,000
38. If the bill is drawn on 1st March, 2022 and its period is 4 months, then the legal due date of the bill is
- (A) 1st July, 2022
(B) 2nd July, 2022
(C) 3rd July, 2022
(D) 4th July, 2022

39. A bill of certain amount drawn on March 4th at 5 months is discounted on June 10 of the same year. The period from the date of discounting to the due date, t is

- (A) 88 days
- (B) 78 days
- (C) 68 days
- (D) 58 days

40. Shashi and Jack invested Rs. 15,000 and Rs. 18,000 in a hardware business. At the end of year, their net loss was Rs. 2,640. The amount of loss borne by Shashi is

- (A) Rs. 1,000
- (B) Rs. 1,200
- (C) Rs. 1,400
- (D) Rs. 1,600