

XII - BUSINESS MATHS & STATISTICS

Time Allowed : 3.00 Hrs.

Maximum Marks: 90

Part - I**I. Choose the correct answer:****20 x 1 = 20**

1. Which of the following is not an elementary transformation?

- a) $R_i \leftrightarrow R_j$ b) $R_i \rightarrow 2R_i + 2C_j$ c) $R_i \rightarrow 2R_i - 4R_j$ d) $C_i \rightarrow C_i + 5C_j$

2. The order and degree of the differential equation $\frac{d^4y}{dx^4} - \left(\frac{d^2y}{dx^2}\right)^4 + \frac{dy}{dx} = 3$

- a) 4,4 b) 4,1 c) 4,3 d) 2,4

3. $E(X - E(X))^2$ is _____.

- a) $E(X)$ b) $E(X^2)$ c) $V(X)$ d) S.D(X)

4. $E(f(x)) =$ _____.

- a) $f(x-h)$ b) $f(x)$ c) $f(x+h)$ d) $f(x+2h)$

5. $\Delta \nabla \equiv$ _____.

- a) $\Delta - \Delta$ b) $\nabla - \nabla$ c) $\Delta - \nabla$ d) $\nabla - \Delta$

6. The P.I. of $(3D^2 + D - 14)y = 13e^{2x}$ is _____.

- a) $\frac{x}{2}e^{2x}$ b) $x e^{2x}$ c) $\frac{x^2}{2}e^{2x}$ d) $13x e^{2x}$

7. If $|A_{n \times n}| = 3$ and $|\text{adj } A| = 243$ then the value of n is _____.

- a) 4 b) 5 c) 6 d) 7

8. $\Gamma\left(\frac{7}{2}\right) =$ _____.

- a) $\frac{\sqrt{\pi}}{8}$ b) $\frac{15}{8}\sqrt{\pi}$ c) $\frac{15}{2}\sqrt{\pi}$ d) $\frac{15}{8}$

9. $\int \frac{2x^3}{4+x^4} dx$ is _____.

- a) $\log|4+x^4|+c$ b) $\frac{1}{2}\log|4+x^4|+c$ c) $\frac{1}{4}\log|4+x^4|+c$ d) $\log\left|\frac{2x^3}{4+x^4}\right|+c$

10. Area bounded by the curve $y = \frac{1}{x}$ between the limits 1 and 2 is _____.

- a) $\log 2$ sq.units b) $\log 5$ sq.units c) $\log 3$ sq.units d) $\log 4$ sq.units

11. If $A = \begin{bmatrix} 2 & 0 \\ 0 & 8 \end{bmatrix}$ then $\rho(A)$ is _____.

- a) 0 b) 1 c) 2 d) n

12. The demand-and-supply function of a commodity are $D(x) = 25 - 2x$ and $S(x) = \frac{10+x}{4}$ then the equilibrium price p_0 is

- a) 5 b) 2 c) 3 d) 10

13. Given $E(X) = 3$ and $E(Y) = -2$ then $E(X - Y)$ is www.TrbTnpsc.com

- a) 3 b) 5 c) 7 d) -2

14. Order and degree of a differential equation are always

- a) negative integers b) integers
c) positive integers d) none of these

15. $\int_{-1}^1 x^3 e^{x^4} dx$ is _____.

- a) 1 b) $2 \int_0^1 x^3 e^{x^4} dx$ c) 0 d) e^{x^4}

16. If the marginal revenue of a firm constant, then the demand function is

- a) MR b) MC c) $C(x)$ d) AC

17. If $\rho(A) \neq \rho(A, B)$ then the system is

- a) consistent and has infinitely many solutions
b) consistent and has a unique solution
c) consistent d) inconsistent

18. If $p(x) = \frac{1}{10}$, $x = 10$, then $E(X) =$ _____.

- a) zero b) $\frac{6}{8}$ c) 1 d) -1

19. $\nabla f(a) =$

- a) $f(a) + f(a - h)$ b) $f(a) - f(a + h)$ c) $f(a) - f(a - h)$ d) $f(a)$

20. $\int_{-\pi/2}^{\pi/2} \cos x dx =$ _____.

- a) 0 b) 2 c) 1 d) 4

Part - II

II. Answer any 7 questions. (Q.No.30 is compulsory)

7 x 2 = 14

21. If $f'(x) = \frac{1}{x}$ and $f(1) = \frac{\pi}{4}$, then find $f(x)$.

22. Find the rank of the matrix $\begin{bmatrix} 1 & -1 \\ 3 & -6 \end{bmatrix}$

23. If $MR = 20 - 5x + 3x^2$, find total revenue function.

24. Find $\Delta^2 e^x$.

25. Find the differential equation of the family of straight lines $y = mx + c$ when m is the arbitrary constant.

26. The discrete random variable X has the probability function

X	1	2	3	4
$P(X = x)$	k	2k	3k	4k

Show that $k = 0.1$

27. If $f(x) = x^2 + 3x$, then show that $\Delta f(x) = 2x + 4$

28. Solve : $(D^2 - 3D - 4) y = 0$

29. Evaluate : $\int_0^{\infty} e^{-4x} x^4 dx$

30. Find the area bounded by the line $y = x$, the x axis and the ordinates $x = 1$ and $x = 2$

Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory)

7 x 3 = 21

31. Show that the equations $x + y + z = 6$, $x + 2y + 3z = 14$, $x + 4y + 7z = 30$ are consistent.

32. Consider the matrix of transition probabilities of a product available in the market in

two brands A and B $A \begin{bmatrix} 0.9 & 0.1 \\ 0.3 & 0.7 \end{bmatrix}$. Determine the market share of each brand in equilibrium position.

33. Evaluate $\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx$

34. Given $U_0 = 1$, $U_1 = 11$, $U_2 = 21$, $U_3 = 28$ and $U_4 = 29$, find $\Delta^4 U_0$.

35. Find the area of the region bounded by the parabola $y = 4 - x^2$, x -axis and the lines $x = 0$, $x = 2$

36. Solve $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2x = 0$ given that $t = 0$, $x = 0$ and $\frac{dx}{dt} = 1$

37. Evaluate $\Delta \left[\frac{1}{(x+1)(x+2)} \right]$ by taking 1 as the interval of differencing.

38. Given $y_3 = 2$, $y_4 = -6$, $y_5 = 8$, $y_6 = 9$, $y_7 = 17$, Calculate $\Delta^4 y_3$

39. Evaluate $\int (2 \cos x - 3 \sin x + 4 \sec^2 x - 5 \operatorname{cosec}^2 x) dx$

40. The following information is the probability distribution of successes.

No. of successes	0	1	2
Probability	$\frac{6}{11}$	$\frac{9}{22}$	$\frac{1}{22}$

Determine the expected number of success.

Part - IV

IV. Answer all the questions.

7 x 5 = 35

41. a) The marginal cost $C'(x)$ and the marginal revenue $R'(x)$ are given by $C'(x) = 50 + \frac{x}{50}$ and $R'(x) = 60$. The fixed cost is ₹200. Determine the maximum profit.

(OR)

b) Evaluate : $\int x \log x dx$

42. a) Using interpolation, find the value of $f(x)$ when $x = 15$

x	3	7	11	19
f(x)	42	43	47	60

(OR)

- b) The probability density function of a random variable X is $f(x) = k e^{-|x|}$, $-\infty < x < \infty$. Find the value of k and also mean and variance for the random variable.
43. a) The demand and supply functions under perfect competition are $p_d = 1600 - x^2$ and $p_s = 2x^2 + 400$ respectively. Find the consumer's surplus and producer's surplus.

(OR)

- b) Solve $(D^2 - 3D + 2)y = e^{3x}$ which shall vanish $x = 0$ and for $x = \log 2$
44. a) Solve $\frac{dy}{dx} = \frac{3x - 2y}{2x - 3y}$

(OR)

- b) A discrete random variable X has following probability function.

$X = x$	0	1	2	3	4	5	6	7
$p(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

- i) Find k
- ii) Evaluate $p(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$
- iii) If $P(X \leq x) > \frac{1}{2}$ then find the

45. a) Show that the following system of equations have unique solution $x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + 9z = 6$ by Rank method.

(OR)

b) Evaluate: $\int \frac{3x+2}{(x-2)(x-3)} dx$

46. a) Solve $(3D^2 + D - 14)y = 4 - 13e^{-2x/3}$

(OR)

- b) Using Newton's formula interpolation estimate the population for the year 1905 from the table.

Year	1891	1901	1911	1921	1931
Population	98,752	1,32,885	1,68,076	1,95,670	2,46,050

47. a) Elasticity of a function $\frac{E_y}{E_x}$ is given by $\frac{E_y}{E_x} = \frac{-7x}{(1-2x)(2+3x)}$. Find the function when $x = 2$, $y = \frac{3}{8}$

(OR)

- b) Let X be a continuous random variable with probability density function.

$$f(x) = \begin{cases} \frac{3}{x^4} & x \geq 1 \\ 0 & \text{otherwise} \end{cases}$$

Find mean and variance of X .