DEEPAK FINAL MODEL QUESTION PAPER - 2025

MODEL QUESTION PAPER - 1 (09/03/2025)

12th Standard

Maths

Date : 10-03-25

Reg.No. : ☐☐☐☐☐☐

Exam Time : 03:00 Hrs Total Marks : 90

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I. Answer All the Questions. 20 x 1 = 20

1) The augmented matrix of a system of linear equations is $\begin{bmatrix} 1 & 2 & 7 & 3 \\ 0 & 1 & 4 & 6 \\ 0 & 0 & \lambda - 7 & \mu + 5 \end{bmatrix}$. The system has infinitely many solutions if

(a) $\lambda = 7, \mu \neq -5$ (b) $\lambda = -7, \mu = 5$ (c) $\lambda \neq 7, \mu \neq -5$ (d) $\lambda = 7, \mu = -5$

2) z_1, z_2 and z_3 are complex number such that $z_1 + z_2 + z_3 = 0$ and $|z_1| = |z_2| = |z_3| = 1$ then $z_1^2 + z_2^2 + z_3^3$ is

(a) 3 (b) 2 (c) 1 (d) 0

3) The value of $\left(\frac{1+\sqrt{3}i}{1-\sqrt{3}i}\right)^{10}$ is

(a) $cis\frac{2\pi}{3}$ (b) $cis\frac{4\pi}{3}$ (c) $-cis\frac{2\pi}{3}$ (d) $-cis\frac{4\pi}{3}$

4) According to the rational root theorem, which number is not possible rational zero of $4x^7 + 2x^4 - 10x^3 - 5$?

(a) -1 (b) $\frac{5}{4}$ (c) $\frac{4}{5}$ (d) 5

5) The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

(a) [1, 2] (b) [-1, 1] (c) [0, 1] (d) [-1, 0]

6) The centre of the circle inscribed in a square formed by the lines $x^2 - 8x - 12 = 0$ and $y^2 - 14y + 45 = 0$ is

(a) (4, 7) (b) (7, 4) (c) (9, 4) (d) (4, 9)

7) An ellipse has OB as semi minor axes, F and F' its foci and the angle FBF' is a right angle. Then the eccentricity of the ellipse is

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{\sqrt{3}}$

8) If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar, non-zero vectors such that $[\vec{a}, \vec{b}, \vec{c}]$ = 3, then $\{[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}]\}^2$ is equal to

(a) 81 (b) 9 (c) 27 (d) 18

9) The position of a particle moving along a horizontal line of any time t is given by $s(t) = 3t^2 - 2t - 8$. The time at which the particle is at rest is

(a) t = 0 (b) $t = \frac{1}{3}$ (c) t =1 (d) t = 3

10) What is the value of the limit $\lim_{x\to 0}\left(\cot x - \frac{1}{x}\right)$ is

(a) 0 (b) 1 (c) 2 (d) ∞

11) If v (x, y) = log ($e^x + e^y$), then $\frac{\partial v}{\partial x} + \frac{\partial v}{\partial y}$ is equal to

(a) $e^x + e^y$ (b) $\frac{1}{e^x+e^y}$ (c) 2 (d) 1

12) The value of $\int_{-1}^{2} |x| dx$ is

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

13) The differential equation representing the family of curves y = Acos(x + B), where A and B are parameters,is

(a) $\frac{d^2y}{dx^2} - y = 0$ (b) $\frac{d^2y}{dx^2} + y = 0$ (c) $\frac{d^2y}{dx^2} = 0$ (d) $\frac{d^2x}{dy^2} = 0$

14) The solution of the differential equation $2x\frac{dy}{dx} - y = 3$ represents

(a) straight lines (b) circles (c) parabola (d) ellipse

15) Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed n times. Then the possible values of X are

(a) i + 2n, i = 0,1,2... n (b) 2i- n, i = 0,1,2... n (c) n - i, i = 0,1,2... n (d) 2i + 2n, i = 0, 1, 2...n

16) In the set Q define a⊙b = a+b+ab. For what value of y, 3⊙(y⊙5) = 7?

(a) y = $\frac{2}{3}$ (b) y = $\frac{-2}{3}$ (c) y = $\frac{-3}{2}$ (d) y = 4

17) The value of $\sin\left[arc\ cos\left(\frac{-1}{2}\right)\right]$ is ________

(a) $\frac{1}{\sqrt{2}}$ (b) 1 (c) $\frac{\sqrt{3}}{2}$ (d) None of these

18) If B, B^1 are the ends of minor axis, F_1, F_2 are foci of the ellipse $\frac{x^2}{8} + \frac{y^2}{4}$ = 1 then area of $F_1BF_2B^1$ is ___________

(a) 16 (b) 8 (c) $16\sqrt{2}$ (d) $32\sqrt{2}$

19) If f(x, y, z) = sin (xy) + sin (yz) + sin (zx) then f_{xx} is ______________

(a) -y sin (xy) + z^2 cos (xz) (b) y sin (xy) - z^2 cos (xz) (c) y sin (xy) + z^2 cos (xz)
(d) -y^2 sin (xy) - z^2 cos (xz)

20) If $\int_0^a f(x)dx + \int_0^a f(2a-x)dx =$ ___________

(a) $\int_0^a f(x)dx$ (b) $2\int_0^a f(x)dx$ (c) $\int_0^{2a} f(x)dx$ (d) $\int_0^{2a} f(a-x)dx$

II. Answer Any **SEVEN** Questions. **Question No.30** is Compulsory. 10 x 2 = 20

21) Find the rank of the following matrices which are in row-echelon form :

$$\begin{bmatrix} 2 & 0 & -7 \\ 0 & 3 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

22) Find the square roots of
–5 –12i .

23) Find centre and radius of the following circles.
$x^2 + y^2 + 6x - 4y + 4 = 0$

24) Find the acute angle between the following lines
$\frac{x+4}{3} = \frac{y-7}{4} = \frac{z+5}{5}, \vec{r} = 4\hat{k} + t(2\hat{i} + \hat{j} + \hat{k})$

25) Compute the limit $\lim\limits_{x\to a}\left(\frac{x^n-a^n}{x-a}\right)$

26) Find df for $f(x) = x^2 + 3x$ and evaluate it for
$x = 2$ and $dx = 0.1$

27) Evaluate the following
$\int_0^{\pi/2} sin^{10}x \quad dx$

28) Find value of m so that the function $y = e^{mx}$ is a solution of the given differential equation.
$y' + 2y = 0$

29) How many rows are needed for following statement formulae?
$p \vee \neg t \wedge (p \vee \neg s)$

30) Prove that $tan^{-1}\left(\frac{1}{7}\right) + tan^{-1}\left(\frac{1}{13}\right) = tan^{-1}\left(\frac{2}{9}\right)$

III. Answer Any **SEVEN** Questions. **Question No.40** is Compulsory. 10 x 3 = 30

31) If |z| = 2 show that $3 \leq |z + 3 + 4i| \leq 7$

32) If α, β and γ are the roots of the cubic equation $x^3+2x^2+3x+4 = 0$, form a cubic equation whose roots are, 2α, 2β, 2γ

33) Find the value of
$sin^{-1}\left(cos\left(sin^{-1}\left(\frac{\sqrt{3}}{2}\right)\right)\right)$

34) A line 3x+4y+10 = 0 cuts a chord of length 6 units on a circle with centre of the circle (2,1). Find the equation of the circle in general form.

35) Find the shortest distance between the two given straight lines
$\vec{r} = (2\hat{i} + 3\hat{j} + 4\hat{k}) + t(-2\hat{i} + \hat{j} - 2\hat{k})$ and $\frac{x-3}{2} = \frac{y}{-1} = \frac{z+2}{2}$

36) Prove that the function f(x) = x – sin x is increasing on the real line. Also discuss for the existence of local extrema.

37) Let $f(x) = \sqrt[3]{x}$. Find the linear approximation at x = 27. Use the linear approximation to approximate $\sqrt[3]{27.2}$

38) Evaluate $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}$dx.

39) Solve the following differential equations or show that the solution of
$\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

40) If X~ B(n, p) such that 4P(X = 4) = P(X = 2) and n = 6. Find the distribution, mean and standard deviation of X.

IV. Answer **All** the Questions. 14 x 5 = 70

41) a) Investigate for what values of λ and μ the system of linear equations x + 2y + z = 7 , x + y + λz = μ , x + 3y – 5z = 5 has
(i) no solution
(ii) a unique solution
(iii) an infinite number of solutions

(OR)

b) Solve the equations:
$6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$

42) a) Find the fourth roots of unity.

(OR)

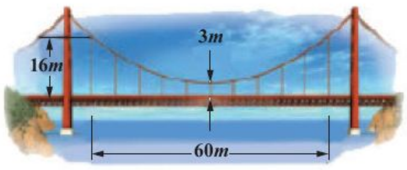
b) A particle moves along a line according to the law $s(t) = 2t^3 - 9t^2 + 12t - 4$, where t ≥ 0.
(i) At what times the particle changes direction?
(ii) Find the total distance travelled by the particle in the first 4 seconds.
(iii) Find the particle's acceleration each time the velocity is zero.

43) a) Prove that $tan^{-1}x + tan^{-1}\frac{2x}{1-x^2} = tan^{-1}\frac{3x-x^3}{1-3x^2}, |x| < \frac{1}{\sqrt{3}}$

(OR)

b) In a murder investigation, a corpse was found by a detective at exactly 8 p.m. Being alert, the detective also measured the body temperature and found it to be 70°F. Two hours later, the detective measured the body temperature again and found it to be 60°F. If the room temperature is 50°F, and assuming that the body temperature of the person before death was 98.6°F, at what time did the murder occur? [log(2.43) = 0.88789; log(0.5)=-0.69315]

44) a) Parabolic cable of a 60m portion of the roadbed of a suspension bridge are positioned as shown below. Vertical Cables are to be spaced every 6m along this portion of the roadbed. Calculate the lengths of first two of these vertical cables from the vertex.



(OR)

b) The cumulative distribution function of a discrete random variable is given by

$$F(x) = \begin{cases} 0 & \text{for } -\infty < x < 0 \\ \frac{1}{2} & \text{for } 0 \le x < 1 \\ \frac{3}{5} & \text{for } 1 \le x < 2 \\ \frac{4}{5} & \text{for } 2 \le x < 3 \\ \frac{9}{10} & \text{for } 3 \le x < 4 \\ 1 & \text{for } 4 \le x < \infty \end{cases}$$

Find
(i) the probability mass function
(ii) P(X < 3) and
(iii) P(X $\geq$2).

45) a) Prove by vector method that sin(α + β) = sin α cos β + cos α sin β

(OR)

b) Find the area of the region bounded by y = tan x, y = cot x and the lines x = 0, x = $\frac{\pi}{2}$, y = 0

46) a) Find the parametric vector, non-parametric vector and Cartesian form of the equations of the plane passing through the points (3, 6, −2), (−1,−2, 6) , and (6, 4, −2).

(OR)

b) Prove that p→(¬q V r) ≡ ¬pV(¬qVr) using truth table.

47) a) Find the foci, vertices and length of major and minor axis of the conic $4x^2 + 36y^2 + 40x - 288y + 532 = 0$

(OR)

b) If u = $\sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, Show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}tanu$

ALL THE BEST

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