JAIN COLLEGE

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SUBJECTMATHEMATICS

II PUC

MOCK – I

Timings Allowed: 3 Hrs 15 Minutes ***Total Marks: 100***

Instructions: i) The question paper has 5 parts. A,B,C,D,E. Answer all the parts.

ii) Part A carries 10 marks. Part B carries 20 marks, Part C and Part D carries 30 marks and Part E carries 10 marks.

iii) Write the question number properly as indicated in the question paper.

I ANSWER ALL **1X10=10**

1. Give an example which is transitive but neither reflexive nor symmetric
2. Find the value of $\cos^{-1}(cos\ \frac{7\pi}{6})$
3. Find x if $\begin{matrix} 2 & 3 \\ 4 & 5 \end{matrix} = \begin{matrix} x & 3 \\ 2x & 5 \end{matrix}$
4. A Matrix has 18 elements , What are the possible orders can it have?
5. Find derivative of $cos\ \sqrt{x}$
6. Write anti derivative of e^{2x} w.r.t x
7. Define colliear vectors
8. If a line has direction ratios -18,12,-4 , then what are its direction cosines?
9. Define Optimum function
10. If p(B)=0.5, p(A$\cap B$)=0.32. Find p(A/B)

<u>PART B</u>

II ANSWER ANY TEN . **2x10=20**

11. Show that the relation R in the set { 1,2,3} given by R={(1,2),(2,1)} is symmetric but neither reflexive nor transitive
12. Write in its simplest form $tan^{-1}\ \frac{cosx-sinx}{cosx+sinx}$,$0 < x < 180$

13. If sin $sin^{-1} \frac{1}{5} + cos^{-1}$ x =1. Find x
14. IF each element of a row (column) of a determinant is multiplied by a scalar 'k' , then its value gets multiplied by k
15. Discuss the continuity of function f(x)=x^3+x^2-1
16. Find the derivative of $x^y+y^x=1$
17. $e^x sinx\, dx$
18. Find local maxima of the function f(x)=x^3-3x
19. $\frac{1}{sin^2xcos^2x}dx$
20. Find order and degree of D.E $xy\frac{d^2y}{dx^2} + x \left(\frac{dy}{dx}\right)^2 + y\frac{dy}{dx}$ =0
21. Verify that vectors (2,-1,1),(1,-3,-5) (3,-4,-4) form vectors of a right angled triangle
22. Find the value of k, if the points (1,2), (k,-4), (5,6) are collinear.
23. Find the distance of a point (2,5,-3) from the plane $r. \left(6\imath - 3\jmath + 2k\right) = 4$
24. Bag I contains 3 red and 4 black balls while another Bag II contains 5 red and 6 black balls . One ball is drawn at random from one of the Bags and it is found to be Red . Find the probability that it was drawn from Bag II

PART C

III ANSWER ANY TEN. 10X3=30

25. F:N→ N be defined by f(n)=$f(x) = \begin{cases} \frac{n+1}{2} & n \text{ is odd} \\ \frac{n}{2}, & n \text{ is even} \end{cases} \forall n \in N$

    IS f bijective? Justify
26. Prove that $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}$;xy<1
27. Express the matrix $\begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix}$ as the sum of symmetric and a skew symmetric matrix
28. Verify Mean value theorem for f(x)=x^3-5x^2-3x in [1 3]
29. If y=$\cos^{-1}\left(\frac{2x}{1+x^2}\right)$ $; -1 < x < 1\ Find\ \frac{dy}{dx}$
30. Find the intervals in which f(x)=$4x^3-6x^2-72x+30$ is (i)Strictly increasing (II)strictly decreasing
31. $\frac{1}{x+xlogx}dx$
32. $\frac{e^x(1+x)}{cos^2(xe^x)}dx$
33. $Find$ the area bounded by y=3x+2 and x axis and the ordinates x=-1 and x=1
34. Form the D.E representing the family of Ellipse having foci on x axis and centre at origin
35. If $a = 5\imath - \jmath - 3k$, $b = \imath + 3\jmath - 5k$, $Show\ that\ a + b\ and\ a - b\ are$ perpendicular
36. $a = 2\imath + 2\jmath + 3k$, $b = 2\jmath + k - \imath$,

    $c = 3\imath + \jmath\ such\ that\ a + \alpha b\ \ is\ perpendicular\ to\ \ c\ find\ \alpha$,

37. Find mean number of heads in three tosses of a fair coin
38. Find the vector and Cartesian equation of the lines that passes through the origin and (5,-2,3)

PART D

IV ANSWER ANY SIX **6X5=30**

39. F:N→R be a function defined by $f(x)=4x^2+12x+15$. Show that f: N→ S , S is range of f, is invertible . Find inverse of f
40. If A= $\begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}$, B= $\begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}$, C= $\begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}$ Verify A(BC)=(AB)C
41. Solve by Matrix method 3x-2y+3z=8,2x+y-z=1,4x-3y+2z=4
42. If $Y=3e^{2x}+2e^{3x}$, Prove that $y^{II}-5y^{I}+6y=0$
43. The length x of a rectangle is decreasing at the rate of 3cm/minute and the width y is increasing at the rate of 2 cm/minute . When x=10cm and y=6cm, find the rate of change of (a) the perimeter (b)the area of the rectangle
44. Find integral of $\int \sqrt{x^2-a^2}\,dx$, hence evaluate $\int \sqrt{x^2-4}\,dx$
45. Solve the differential equation $(1+x^2)dy+2xydx=\cot x\,dx$ $(x\neq 0)$
46. Find the area of triangle whose sides have the equation y=2x+1,y=3x+1 and x=4
47. Derive the equation of the plane passing through 3-non –collinear points.
48. A person buys a lottery ticket in 50 lotteries , in each of which his chance of winning a prize is 1/100. What is the probability that he win a prize (i) at least once (ii)exactly once (iii) at least twice

PART E

V Answer any ONE **1X10=10**

49. (I)Prove that $\int_a^b f(x)\,dx = \int_a^b f(a+b-x)\,dx$ $hence\ find$ $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$

    (II)Prove that $\begin{vmatrix} a^2 & ab & ac \\ ab & b^2+1 & bc \\ ac & cb & c^2+1 \end{vmatrix}$ $=1+a^2+b^2+c^2$
50. (i)There are two types of fertilisers F_1 and F_2 .F_1 consists of 10% of nitrogen and 6% phosphoric acid and F_2 consists of 5% of nitrogen and 10% phosphoric acid. After testing the soil conditions , a farmer finds that she needs at least 14 kg of nitrogen and 14 kg of phosphoric acid for her crop . If F_1 costs Rs.6/kg and F_2costs Rs.5/kg, Find how much of each type of fertilisers should be used so that nutrient requirement are me at a minimum cost . What is the minimum cost?

    (ii) Find the value of k if f(x)=$f(x) = \begin{cases} 3, & x>2 \\ kx^2, & x\leq 2 \end{cases}$ is continuous at x=2

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