JAIN COLLEGE

463/465, 18th Main Road, SS Royal, 80 Feet Road, Rajarajeshwari Nagar,
Bangalore - 560 098

Date: *SUBJECT: MATHEMATICS*

II PUC
MOCK II

Timings Allowed: 3 Hrs 15 minutes.   *Total Marks: 100*

Instructions: 1. The question paper has 5 parts A, B,C,D and E. Answer all parts.
2. Part A carries 10 marks, Part-B carries 20 marks, Part-C carries 30 marks, Part-D carries 30 marks and Part-E carries 10
3. Write the question number properly as indicated in the question paper

PART A

I Answer all ten .Each carry one mark .   **1X10=10**

1. Prove that f:R→R ;f(x)=2x is 1-1 function
2. Find the Principal value of $\csc^{-1}(-\sqrt{2})$
3. Define a scalar matrix
4. If A is a matrix of order 3X3, then find |adjA| with |A|=2
5. Differentiate $e^{\sin^{-1}x} w.r.t\ 'x'$
6. $\int secx\ (secx + tanx)dx$
7. Find a vector in direction of vector $5\hat{\imath} - \hat{\jmath} + 2\hat{k}$ which has magnitude 8 units
8. Find the intercepts cut off by the plane 2x+y-z=5
9. Define Optimal solution
10. An urn contains 5 red and 2 black balls. Two balls are randomly selected .Let X represents the number of black
    balls, What are the possible values of X?

II Answer any ten .Each carry two mark   **2X10=20**

11. If f:R→R given by f(x)=(3-x³)^{1/3}.Find fof(x)
12. Simplify $\tan^{-1}\left[\frac{acosx-bsinx}{bcosx+asinx}\right]$ if $\frac{a}{b}tanx > -1$
13. Shoe that tan⁻¹1/2 + tan⁻¹2/11=tan⁻¹3/4
14. For what values of x and y make the following pair of matrices equal $\begin{bmatrix} 3x + 7 & 5 \\ y + 1 & 2 - 3x \end{bmatrix} = \begin{bmatrix} 0 & y - 2 \\ 8 & 4 \end{bmatrix}$
15. Differentiate yˣ=xʸ
16. Find $\frac{dy}{dx}$ if x^{2/3}+y^{2/3}=a^{2/3}
17. The total cost in Rs is C(X)=0.007x³ – 0.003x²+15x+4000. Find Marginal cost when 17 units are produced
18. Evaluate $\int_2^3 \frac{x}{x^2+1}dx$
19. Evaluate $\int \frac{e^{\tan^{-1}x}}{1+x^2}dx$
20. Find order and degree $(y^{III})^2 + (y^{II})^3+(y^{I})^4+y^5=0$
21. Show that $2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $-4\hat{\imath} + 6\hat{\jmath} - 8\hat{k}$ are collinear
22. Find area of triangle with vertices A(1,1,2),B(2,3,5) and c(1,5,5)
23. Find cartesian equation of the line parallel to y-axis and passing through the point (1,1,1)
24. Find the probability distribution of number of heads in 2 tosses of a coin

PART C

III **Answer any ten .Each carry three mark.**   3X10=30

25. Determine whether relation R in a set A={1,2,3,..6} defined as R={(x,y): b=a+1} is reflexive, symmetric

26. By using elementary transformation find A^{-1} of matrix A=$\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

27. Simplify $\tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$,if a/b>-1

28. If $x=\sqrt{a^{\sin^{-1}t}}$,$y=\sqrt{a^{\cos^{-1}t}}$ Show that y^l=-y/x

29. Verify Mean value thorem if f(x)=x^3-5x^2-3x in [1,3].Find all c∈(1,3) such that $f^1(c)$=0

30. Using differentiation find approximate value of $(25)^{1/3}$

31. Evaluate $\int e^x \frac{1+\sin x}{1+\cos x} dx$

32. Evaluate $\int_{-1}^{1} \frac{dx}{x^2+2x+5}$

33. Find the area of the region bounded by the curve y=x^2 and the line y=4

34. Find the equation of the curve passing through (0,-2) given that at any point (x,y) on curve , the product of slope of its tangent and y-coordinate of the point is equal to x-coordinate

35. Prove that $[\vec{a}, \vec{b}, \vec{c} + \vec{d}] = [\vec{a}, \vec{b}, \vec{c}] + [\vec{a}, \vec{b}, \vec{d}]$

36. Find 'k' and 'μ' if $(2\hat{\imath} + 6\hat{\jmath} + 27\hat{k}) X (\hat{\imath} + k\hat{\jmath} + \mu\hat{k}) = \vec{0}$

37. Find the shortest distance between $\frac{x+1}{-1} = \frac{1+y}{-6} = \frac{z+1}{-1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$

38. A man is known to speak truth 3 out of 4 times .He throws a die and reports that it is a six. Find the probability that it is actually a six.

PART D

IV **Answer any six .Each carry five mark**   5X6=30

39. Let f:[-1,1]→R given by f(x)=$\frac{x}{x+2}$ is 1-1 .Find inverse of function f:[-1 ,1]→ *Range of f*

40. If A=$\begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}$,B=$\begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}$,C=$\begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$ Compute A+B,B-C. Also verify A+(B-C)=(A+B)-C

41. Solve by matrix method 2x+y+z=1,x-2y-z=3/2 ,3y-5z=9

42. If y=3cos(logx)+4sin(logx).Show that $x^2y_2+xy_1+y=0$

43. A ladder 5m long is leaning against a wall . The bottom of ladder is pulled along ground , away from the wall at the rate of 2cm/sec. How fast is its height on the wall decreasing when the foot of ladder is 4m away from the wall?

44. Prove that $\int \sqrt{x^2 - a^2} dx$,hence Evaluate $\int \sqrt{x^2 - 121} dx$

45. Find area of lying above x axis and included between circle x^2+y^2=8x and inside parabola y^2=4x

46. Solve Differential equation $(1+x^2)\frac{dy}{dx}+2xy=\frac{1}{1+x^2}$

47. Derive condition for coplanarity of two lines in a space both In vector and Cartesian form

48. Find probability of getting at most 2 sixes in six throws of a single die.

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

49. a)Prove that $\int_0^{2a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & if \quad f(2a-x) = f(x) \\ 0 & if \quad f(2a-x) = -f(x) \end{cases}$

   b) Find all points of discontinuity of f where f is defined by f(x)=$\begin{cases} x^{10} - 1 & if \ x \le 1 \\ x^2 & x > 1 \end{cases}$

50. a)A diet is to contain at least 80 units of vitamin A and 100 units of minerals. Two foods F1 and F2 are available. Food F1 costs Rs 4 per unit and food F2 costs Rs 6 per unit. One unit of food F1 contains 3 unit of vitamin A and 4 unit of minerals. One unit of food F2 contains 6 unit of vitamin A and 3 units of minerals. Formulate this LPP. Find the minimum cost for the diet that consists of mixture of these foods and also meets the minimal nutritional requirements.

   b) Prove that $\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & z+x+2z \end{vmatrix} = 2(x+y+z)^3$

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