JAIN COLLEGE

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

II PUC MOCK I DEC 2019-2020   ***SUBJECT:MATHEMATICS***

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

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 $\tan^{-1}(\sqrt{3})$
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. $\int (2x^2+e^x)dx$
7.   Write two different vectors having same direction
8.   If a line makes angles 90^0 ,135^0 ,45^0 with x, y, z axes respectively ,find their direction cosines
9.   Define optimum solution in LPP
10.   X represent difference between numbers of heads and number of tails when a coin is tossed 3 times. What are the possible values of x?

Part B

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

11.   If f:R→R given by f(x)=$(3-x^3)^{1/3}$.Find f∘f(x)
12.   Simplify $\tan^{-1}\left[\frac{acosx-bsinx}{bcosx+asinx}\right]$ if $\frac{a}{b}tanx > -1$
13.   Shoe that $\tan^{-1}1/2 + \tan^{-1}2/11=\tan^{-1}3/4$
14.   For what values of x and y if $\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix} = \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$
15.   Differentiate $y^x=x^y$
16.   Find $\frac{dy}{dx}$ if $x^{2/3}+y^{2/3}=a^{2/3}$
17.   The total cost in Rs is $C(X)=0.007x^3 - 0.003x^2+15x+4000$. Find Marginal cost when 17 units are produced
18.   Evaluate $\int_2^3 \frac{x}{x^2+1}dx$
19.   Evaluate $\int_0^{\pi/2} sin2x \, dx$
20.   Find order and degree of the differential equation $x^2y_2+xy_1=0$
21.   Show that the vectors $2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $-4\hat{\imath}+6\hat{\jmath} - 8\hat{k}$ are collinear
22.   Find the area of triangle having the points A(1,1,1),B(1,2,3),C(2,3,1) as its vertices
23.   Find equation of plane which passes through the intersection of the planes 3x-y+2z-4=0 and   x+y+z-2=0 and the point (2,2,1)
24.   Find the probability distribution of the number of tails in simultaneous tosses of three coins

PART C

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

25.   The 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=$\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$
27.   Solve $\tan^{-1}2x +\tan^{-1}3x=\frac{\pi}{4}$
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 $\int e^x \frac{1+sinx}{1+cosx} dx$

32. Express $\int_0^2 e^x \, dx$ as limit of a sum

33. Find the area of the region bounded by the curve $y^2=4x$ and its latus rectum

34. Find the particular solution of the differential equation $\frac{dy}{dx}=-4xy^2$ such that y=1,x=0

35. If $\vec{a}, \vec{b}, \vec{c}$ are unit vector such that $\vec{a} + \vec{b} + \vec{c}=0$. Find values of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$

36. If $\vec{a}=-4\hat{\imath} - 6\hat{\jmath} + \alpha\hat{k}$, $\vec{b}= -\hat{\imath} + 4\hat{\jmath} + 3\hat{k}$ and $\vec{c}=-8\hat{\imath} - \hat{\jmath} + 3\hat{k}$ are coplanar,Find 'α'

37. Find the angle between the line $\frac{x+1}{2}=\frac{y}{3}=\frac{z-3}{6}$ and 10x +2y -11z=3

38. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers . The probability of an accident are 0.01,0.03 and 0.15 respectively .One of the insured person meets an accident. What is the probability that he is a scooter driver?

PART D

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

39. Let f:R→R given by f(x)=4x+3.Show that f is invertible .Find inverse 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=$\begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$ 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=500e^{7x} +600e^{-7x} Show that $\frac{d^2y}{dx^2}=49y$

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. Find $\int \frac{1}{\sqrt{x^2-a^2}} dx$ w.r.t. 'x' hence evaluate $\int \frac{1}{\sqrt{x^2-25}} dx$

45. Find the area bounded by $4x^2+4y^2=9$, which is interior to the parabola $x^2=4y$

46. Find the equation of the curve passing through the point (0,2) given that the sum of the coordinates of any point on the curve exceeds the magnitude of the slope of the tangent to the curve at that point by 5

47. Find the shortest distance between two skew lines

48. If a pair of coins is tossed 8 times Find the probability of (i)atleast five heads (ii)atmost five heads

PART E

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) For what value of 'k' f(x) is continuous at $\frac{\pi}{2}$, f(x)=$\begin{cases} \frac{kcosx}{\pi-2x} & x \neq \frac{\pi}{2} \\ 3 & x = \frac{\pi}{2} \end{cases}$

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 unit 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 . Prove that $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix}=(x^3 - 1)^2$

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