SRI BHAGAWAN MAHAVEER JAIN COLLEGE

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Mock Examination Question Paper-1 (January 2019)

Course:	II PUC
Max. Marks:	100

Subject:	Mathematics
Duration:	3:15 hrs.

Instructions: The question paper has FIVE parts. Answer all
Use graph sheet for the question on LPP in Part E.

PART –A

I Answer ALL the questions: 10 x 1 = 10

1 Give an example to show that ‘*’: N x N →N given by *(a, b) = a – b is not a binary operation.

2 Write the range of $\cos^{-1}(x)$.

3 If A is a square matrix and |A| = 8. Find the value of $|AA^{|}|$.

4 Find x and y if $\begin{bmatrix} x+2 & y-3 \\ 0 & 4 \end{bmatrix}$ is a scalar matrix.

5 Find dy/dx if $y = \sin(x^2 + 5)$.

6 Evaluate $\int \sec^2(7-4x)\,dx$.

7 Write the vector joining the points A (2, 3, 0) and B (-1, -2, -4).

8 Find the cartesian equation of a line passing through the points (-1, 0, 2) and (3, 4, 6).

9 Define objective function in LPP.

10 If $P(A) = 4/15$ $P(B/A) = 2/5$. Find P (A∩B).

PART-B

II Answer any TEN questions: 10 x 2 = 20

11 Find gof and fog if $f(x) = 8x^3$ and $g(x) = x^{1/3}$.

12 Evaluate: $\sin\left[\pi/3 - \sin^{-1}\left(-1/2\right)\right]$.

13 Solve : $\tan^{-1}\left[\frac{1-x}{1+x}\right] = \frac{1}{2}\tan^{-1}(x)$.

14 Without expanding the determinant, Evaluate:

$$\begin{bmatrix} 4 & a & b+c \\ 4 & b & c+a \\ 4 & c & a+b \end{bmatrix}.$$

15 Check the continuity of the function f given by f(x) = 2x+3 at x = 1.

16 Find $\frac{dy}{dx}$ if $y = \sec^{-1}\left[\frac{1}{2x^2-1}\right] : 0 < x < 1/\sqrt{2}$.

17 Using differentials approximate $(25)^{1/3}$.

18 Evaluate : $\int \frac{1}{\sin^2 x \cos^2 x}\,dx$.

19 Evaluate: $\int \frac{e^{\tan^{-1} x}}{1+x^2}\,dx$.

20 Find the order and degree of the differential equation $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$.

21 If $|\vec{a}+\vec{b}| = |\vec{a}-\vec{b}|$ prove that $\vec{a}$ and $\vec{b}$ are perpendicular.

22 If the position vector of the points A and B respectively are i + 2j – 3k and j – k. Find the direction consine of $\overrightarrow{AB}$.

23 Find the equation of the plane x + y + z – 6 = 0 and 2x + 3y + 4z + 5 = 0 and the point (1, 1, 1).

24 Two coins are tossed once E : no tail appears F : no head appears find P (E / F).

PART-C

III Answer any TEN questions: 10 x 3 = 30

25 Show that the relation R in the set A ={1, 2, 3, 4, 5}given by R = {(a, b) : |a – b| is even} is an equivalence relation.

26 Show that $2\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{7}\right) = \tan^{-1}\left(\frac{31}{17}\right)$.

27 Express the matrix $A = \begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$ as the sum of symmetric and skew-symmetric matrix.

28 Differentiate $x^{\sin x} + (\sin x)^{\cos x}$ with respect to x.

29 Find two numbers whose product is 100 and whose sum is minimum.

30 Differentiate $\text{Sin}^2 x$ with resepct to $e^{\cos x}$.

31 Evaluate: $\int \frac{\sin\left(2\tan^{-1} x\right)}{1+x^2} dx$.

32 Evaluate: $\int e^x \left[\frac{x-3}{(x-1)^3}\right] dx$.

33 Find the area at the region bounded by the curve $y^2 = x$ and the lines x = 1, x =4 and the x – axis in the first quadrant.

34 Form the differential equations representing the family of curves y = a sin (x+b) where ‘a’ and ‘b’ are arbitrary constants.

35 Show that the points A (-1, 4, -3), B (-3, 2, -5) C (-3, 8, -5) and D (-3, 2, 1) are coplonar.

36 Three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ satisfy the condition $\vec{a}+\vec{b}+\vec{c} = 0$. Evaluate the quantity $\mu = \vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$. if $|\vec{a}| = 1$, $|\vec{b}| = 4$ and $|\vec{c}| = 2$.

37 Find the cartesian and vector equation of the line passes through the points (3, -2, -5) and (3, -2, 6).

38 Two cards are drawn successively with replacement from a well shuffled deck of 52 cards. Find the probability distribution of the number of Aces.

PART-D

IV Answer any SIX of the following: 6 x 5 = 30

39 If $f : R \to [-5, \infty)$ given by $g(x) = 9x^2+6x-5$. Show that ‘f’ is invertible with $f^{-1} = \left\{\frac{\sqrt{y+6}-1}{3}\right\}$.

40 If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ Prove that $A^3 - 23A - 401 = 0$

41 Solve by Matrix method: $\begin{array}{l} x+y+3z=10 \\ x-y-z=-2 \\ 2x+3y+4z=4 \end{array}$.

42 If y = 3 cos (logx) + 4 sin (logx) show that $x^2y_2 + x\,y_1 + y = 0$

43 Sand is pouring from a pipe at the rate of 12cm^3 / sec. The falling sand form a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4cms.

44 Find the integral of $\sqrt{a^2 - x^2}$ and hence evaluate $\int \sqrt{1-4x-x^2}\,dx$.

45 Find the area of the region bounded by the parabola $y^2 = 4x$ and the line $y = 2x$.

46 Find the particular solution of the differential equation $\frac{dy}{dx} + \cot x\, y = 4x \operatorname{cosec} x$ given $y = 0$ when $x = \pi/2$.

47 Derive the formula to find the shortest distance between the two skew lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}_1$ and $\vec{r} = \vec{a}_2 + \mu \vec{b}_2$ in the vector form.

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 will with a prize? (i) atleast once (ii) exactly once (iii) atleast twice.

PART-C

V Answer any ONE of the following: 1 x 10 = 10

49 (a) Prove that $\int_0^{2a} f(x)\,dx = \begin{cases} 2\int_0^a f(x)dx \text{ if } f(2a-x) = f(x) \\ 0 \text{ if } f(2a-x) = -f(x) \end{cases}$ *and* hence evaluate $\int_0^{\pi} \frac{x}{a^2\cos^2 x + b^2 \sin^2 x}\,dx$.

(b) Prove that $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$.

50 (a) Minimize and maximize $Z = 3x+9y$ subject to the constraints $x + 3y \le 60$, $x + y \ge 10$, $x \le y$, $x, y \ge 0$ by graphical method.

(b) Find the value of 'k' so that function

$$f(x) = \begin{cases} \frac{1-\cos 2x}{1+\cos 2x} & \text{if } x \neq 0 \\ k & \text{if } x = 0 \end{cases}$$ is a continuous function at $x = 0$.

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