SRI BHAGAWAN MAHAVEER JAIN COLLEGE Vishweshwarapuram, Bangalore. **II PUC MOCK QUESTION PAPERS - 1**	**Course:** II PUC **Subject:** **Mathematics** **Max. Marks:** 100 **Duration:** 3:00 Hrs 15 Mins

Instructions:

- The question paper has five parts namely A, B, C , D and E. Answer all the parts
- Part A has 10 multiple choice questions , 5 fill in the blanks and 5 very short answer questions of 1 mark each
- Part A should be answered continuously at one or two pages of answer sheet and only first answer is considered For the marks in subsection I and II of Part A
- Use the graph sheet for question on linear programming in PART E

PART A

I. Answer ALL the multiple choice questions **10 × 1 = 10**

1. Number of binary operations on the set {a, b} are

   (A) 10 (B) 16 (C) 20 (D) 8

2. If $\boldsymbol{sin^{-1}(1-x) - 2sin^{-1}x = \frac{\pi}{2}}$ then $\boldsymbol{x}$ is equal to

   (A) $0, \frac{1}{2}$ (B) $1, \frac{1}{2}$ (C) 0 (D) $\frac{1}{2}$

3. The number of all possible matrices of order 3 × 3 with entry 0 or 1 is

   (A) 27 (B) 18 (C) 81 (D) 512

4. Let A be a square matrix of order 3 X 3 then $|kA|$ is equal to

   (A) k$|A|$ (B) $k^2|A|$ (C) $k^3|A|$ (D) $3k|A|$

5. The right hand derivative of $\boldsymbol{f(x) = |x|}$ at $\boldsymbol{x = 0}$ is

   (A) 1 (B) -1 (C) 0 (D) does not exist

6. $\int e^x \, secx \, (1 + tanx)dx$

   (A) $e^x cosx + c$ (B) $e^x secx + c$

   (C) $e^x sinx + c$ (D) $e^x tanx + c$

7. If θ is the angle between any two vectors $\vec{a}$ and $\vec{b}$ then $|\vec{a}.\vec{b}| = |\vec{a} \times \vec{b}|$ when θ is equal to

   (A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π

8. The equation of YZ – plane is

   (A) x = 0 (B) y = 0 (C) x = 0 and y =0 (D) z=0

9. Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1, 1), (3, 0) Let $z = px + qy$ where, $q > 0$. condition on p and q so that the minimum of Z occurs at (3, 0) and (1, 1) is

   (A) $p = 2q$ (B) $p = \frac{q}{2}$ (C) $p = 3q$ (D) $p = q$

10. If A and B are events such that $P(A/B) = P(B/A)$ then

(A) $A \subset B$ but $A \neq$ B (B) A = B

(C) $A \cap B = \emptyset$ (D) $P(A) = P(B)$

II Fill in the blanks by choosing the appropriate answer from those given in the bracket 5 × 1 = 5

$$\left(\mathbf{1}, \frac{\mathbf{1}}{\mathbf{10}}, \mathbf{11}, \frac{\mathbf{6}}{\sqrt{\mathbf{29}}}, \frac{\mathbf{3}}{\mathbf{25}}\right)$$

11. If A is an invertible matrix of order 2 and $|A| = 10$ then $|A^{-1}|$ =-------

12. The degree of differential equation $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$ is --------

13. The distance of the plane $2x - 3y + 4z - 6 = 0$ from the origin is --------

14. The slope of the tangent to the curve $y = x^3 - x$ at $x = 2$ is -------

15. If $P(A) = \frac{3}{5}$ and $P(B) = = \frac{1}{5}$ and if A and B are independent events then $P(A \cap B)$ =------

III Answer all the following questions 5 × 1 = 5

16. Define Symmetric Relation

17. Find the derivative of the function $sin\sqrt{x}$ w. r. t x

18. Define Optimal solution in a linear programming problem

19. Find $\int secx(secx + tanx)dx$

20. Define collinear vectors.

PART B

Answer any NINE questions 9 × 2 = 18

21. If f : R→ R and g : R→ R are given by $f(x) = cosx$ and $g(x) = 3x^2$ find gof and fog

22. If $\sin\left(sin^{-1}\frac{1}{5} + cos^{-1}x\right) = 1$ find value of x

23. Write $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$ $x > 1$ in simplest form

24. Find the values of k if area of triangle is 4 sq units and vertices are (k, 0), (4, 0) and (0, 2) using determinants

25. Differentiate x^{cosx} , $x > 0$ w.r.t x

26. Find $\frac{dy}{dx}$, if $\sin^2 x + \cos^2 y = 1$

27. Find the approximate change in the volume of a cube of side x meters caused by increasing the side by 3%.

28. Find $\int cotx \log(sinx)\, dx$

29. Evaluate $\int_0^{2/3} \frac{dx}{4+9x^2}$

30. Form the differential equation of the family of parabolas having vertex at origin and axis along positive y axis.

31. If $(\vec{a}+\vec{b}).(\vec{a}-\vec{b}) = 8$ and $|\vec{a}| = 8|\vec{b}|$ find $|\vec{b}|$

32. Find the area of parallelogram whose adjacent sides are determined by the vectors $\vec{a} = 3\hat{\imath} + \hat{\jmath} + 4\hat{k}$ and $\vec{b} = \hat{\imath} - \hat{\jmath} + \hat{k}$

33. Show that the lines $\frac{x-5}{7} = \frac{y-2}{-5} = \frac{z}{1}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular to each other

34. A random variable X has following probability distribution

X	0	1	2	3	4
P(X)	0.1	K	2k	2k	K

Determine (i) k (ii) $P(X \geq 2)$

PART C

Answer any NINE questions **9 × 3 = 27**

35. Check whether the relation R in $\mathbb{R}$ of real numbers defined as $R = \{(a,b);\ a \leq b^3\}$ is reflexive Symmetric, transitive

36. Prove that $cos^{-1}\left(\frac{4}{5}\right) + cos^{-1}\left(\frac{12}{13}\right) = cos^{-1}\left(\frac{33}{65}\right)$

37. By using elementary transformation find inverse of $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$

38. If $= a(\theta + sin\theta)$, $y = a(1 - cos\theta)$ show that $\frac{dy}{dx} = tan\frac{\theta}{2}$

39. Verify Rolles's theorem for the function $f(x) = x^2 + 2$, $x \in [-2, 2]$

40. Find two positive numbers $x\ and\ y$ such that $x + y = 60$ and xy^3 is maximum

41. Evaluate $\int \frac{2x}{x^2+3x+2}\, dx$

42. Find $\int e^x\, sinx\, dx$

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

44. Find the equation of the curve passing through the point (1, 1) whose differential equation is $xdy = (2x^2 + 1)dx \quad (x \neq 0)$

45. Show that the position vector of a point P which divides the line joining the points A and B having Position vectors $\vec{a}$ and $\vec{b}$ internally in the ratio m:n is $\frac{m\vec{b}+n\vec{a}}{m+n}$

46. Find λ if the vectors $\hat{\imath}-\hat{\jmath}+\hat{k}$, $3\hat{\imath}+\hat{\jmath}+2\hat{k}$ and $\hat{\imath}+\lambda\hat{\jmath}-3\hat{k}$ are coplanar

47. Find the equation of the plane through the intersection of the planes $3x-y+2z-4=0$ and $x+y+z-2=0$ and the point $(2,2,1)$

48. A die is tossed thrice find the probability of getting an odd number atleast once

PART D

Answer any FIVE question **5 × 5 = 25**

49. Consider $f: R_+ \to [-5,\infty)$ given by $f(x)=9x^2+6x-5$. Show that f is invertible And find f^{-1}

50. If $A=\begin{bmatrix}1 & 0 & 2\\ 0 & 2 & 1\\ 2 & 0 & 3\end{bmatrix}$ prove that $A^3-6A^2+7A+2I=O$

51. Solve the following system of linear equation by matrix method
$x-y+2z=7,\quad 3x+4y-5z=-5,\quad 2x-y+3z=12$

52. If $y=e^{acos^{-1}x}$ $-1<x\leq 1$ show that $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}-a^2y=0$

53. A particle moves along the curve $6y=x^3+2$. Find the points on the curve at which the y- coordinate Is changing 8 times as fast as the x- coordinate.

54. Find the integral of $\sqrt{x^2-a^2}$ w. r. t x and hence evaluate $\int\sqrt{x^2-8x+7}\,dx$

55. Find the area of the region bounded by the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$

56. Solve the differential equation $cos^2x\frac{dy}{dx}+y=tanx$ $\left(0\leq x<\frac{\pi}{2}\right)$

57. Derive equation of plane in normal form (both in vector and cartesian form)

58. A die is thrown 6 times. If "getting an odd number " is a success . What is the probability of
(i) 5 success (ii) atleast 5 successes

PART E

Answer the following questions **6**

59. Minimise and Maximise $z = 3x + 9y$

Subject to constraints $x + 3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x, y \geq 0$

Or

Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ and hence evaluate $\int_0^{\frac{\pi}{2}}(2logsinx - logsin2x)dx$ (6)

60. Show that $\begin{vmatrix} x & x^2 & yz \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$

Or

Find the value of k if

$f(x) = \begin{cases} \frac{xcosx}{\pi-2x} & x \neq \frac{\pi}{2} \\ 3 & x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$ (4)

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