DHARWAD DIST MATHEMATICS LECTURERS FORUM 2023-24.

MATHEMATICS MODEL QUESTION PAPERS

BLUEPRINTFORMODELQUESTIONPAPER

SUBJECT:MATHEMAMATICS(35)

CLASS : IIPUC 2023-2024

SL. NO	CHAPTER/CONTENT/DOMAIN/UNIT/THEME	NOOFPERIODS	MARKS	REMEMBER						UNDERSTAND						APPLY						HOTS							MARKS
				PART-A		PART-B	PART-C	PART-D	PART-E	PART-A		PART-B	PART-C	PART-D	PART-E	PART-A		PART-B	PART-C	PART-D	PART-E	PART-A		PART-B	PART-C	PART-D	PART-E		
				1 MARK MCQ	1 MARK FB	2 MARK SA	3 MARK SA	5 MARK LA	4 MARK LA	1 MARK MCQ	1 MARK FB	2 MARK SA	3 MARK SA	5 MARK LA	4 MARK LA	1 MARK MCQ	1 MARK FB	2 MARK SA	3 MARK SA	5 MARK LA	4 MARK LA	1 MARK MCQ	1 MARK FB	2 MARK SA	3 MARK SA	5 MARK LA	6 MARK LA	4 MARK LA	
1	RELATIONSAND FUNCTIONS	9	10	1						1			1							1									10
2	INVERSE TRIGONOMETRIC FUNCTIONS	6	7	1		1	1				1																		7
3	MATRICES	9	9	1			1							1															9
4	DETERMINANTS	12	13		1							1		1		1					1								13
5	CONTINUITYANDDIFFERENTIABILITY	20	19				1	1				1				1			1		1	1							19
6	APLLICATION OFDERIVATIVES	10	8			1						1										1			1				8
7	INTEGRALS	22	20	1				1				2				1			1								1		20
8	APPICATION OFINTEGRATION	5	5											1															5
9	DIFFERENTIAL EQUATIONS	10	9		1									1					1										9
10	VECTORALGEBRA	11	10			1	1			1			1									1							10
11	THREEDIMENSIONAL GEOMETRY	8	9	1		1		1			1																		9
12	LINEARPROGRAMMING	7	7	1																							1		7
13	PROBABILITY	11	9	1		1					1	1													1				9
TOTAL		140	135	7	2	5	4	3		2	3	6	2	4		3			3	1	2	3			2		2		135

SUBJECT:MATHEMATICS (35)

QUESTIONTYPEBASEDONMARKS	NOOFQUESTIONS	MARKS
1MARK	20 (15MCQ+5FB)	20X1=20 (20X1=20)
2MARKS	11 (ANSWERANYSIX)	11X2=22(6X2=12)
3MARKS	11 (ANSWERANYSIX)	11X3=33(6X3=18)
5MARKS	8(ANSWERANYFOUR)	8X5=40(4X5=20)
6MARKS	1 (1INTERNALCHOICE)	2X6=12(1X6=6)
4MARKS	1 (1INTERNALCHOICE)	2X4=8(1X4=4)
TOTAL	52(2INTERNALCHOICE)	135MARKS (80MARKS)

II PUC MATHEMATICS (35)

QUESTION PAPER PATTERN 2023-24 A.YEAR

NUMBER OF QUESTIONS	QUESTION NUMBER	TYPE OF QUESTIONS	TOTAL QUESTIONS	TO BE ANSWERED QUESTIONS	TOTAL MARKS
15 PART A (I)	1 TO 15	MCQ	15	ALL 15 QUESTIONS	15
05 PART A (II)	16 TO 20	FILL IN THE BLANKS	05	ALL 05 QUESTIONS	05
11 PART B	21 TO 31	2M QUESTIONS	11	06	12
11 PART C	32 TO 42	3 MARK QUESTIONS	11	06	18
08 PART D	43 TO 50	5 MARK QUESTIONS	08	04	20
01 PART E	51	6 MARK QUESTION	1	INTERNAL CHOICE	06
01 PART E	52	6 MARK QUESTION	1	INTERNAL CHOICE	04
TOTAL			52Q (135M)	38 Q	80M

SECTIONWISE MARKS DISTRIBUTION

SUBJECT : MATHEMAMATICS (35)

CLASS : II PUC 2023-2024

SL NO	CHAPTER/ CONTENT/ DOMAIN/ UNIT/THEME	NO OF PERIODS	MARKS	SECTIONWISE MARKS							TOTAL MARKS
				PART-A		PART-B	PART-C	PART-D	PART-E		
				1 MARK MCQ	1 MARK FB	2 MARK SA	3 MARK SA	5 MARK LA	6 MARK LA	4 MARK LA	
1	RELATIONS AND FUNCTIONS	9	10	2			1	1			10
2	INVERSE TRIGONOMETRIC FUNCTIONS	6	7	1	1	1	1				7
3	MATRICES	9	9	1			1	1			9
4	DETERMINANTS	12	13	1	1	1		1		1	13
5	CONTINUITY AND DIFFERENTIABILITY	20	19	2		1	2	1		1	19
6	APLLICATION OF DERIVATIVES	10	8	1		2	1				8
7	INTEGRALS	22	20	2		2	1	1	1		20
8	APPICATION OF INTEGRATION	5	5					1			5
9	DIFFERENTIAL EQUATIONS	10	9		1		1	1			9
10	VECTOR ALGEBRA	11	10	2		1	2				10
11	THREE DIMENSIONAL GEOMETRY	8	9	1	1	1		1			9
12	LINEAR PROGRAMMING	7	7	1					1		7
13	PROBABILITY	11	9	1	1	2	1				9
TOTAL		140	135	15	5	11	11	8	2	2	135

SECOND PUC MODEL QUESTION PAPER 2023-2024

SUBJECT : MATHEMATICS (35)

TIME : 3 Hours 15 Minutes [Total questions : 52] Max. Marks : 80

Instructions : 1. The question paper has five parts namely A, B, C, D and E. Answer all the Parts.

2. Part A has 15 multiple choice questions, 5 fill in the blank questions.

3. Use the graph sheet for question on linear programming problem in Part E.

PART -A

I. Answer all the multiple choice questions : 15 x 1 = 15

1. The relation R in the set { 1,2,3 } given by { (1,2) ,(2,1) } is
a) reflexive b) symmetric
c) transitive d) equivalence relation

2. If f : R → R be defined as f(x) = x^4,then the function f is
a) one-one and onto b) many-oneandonto
c) one-one but not onto d) neither one-one nor onto

3. The principal value branch of $\cot^{-1} x$ is
a) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ b) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$
c) $[0\,,\pi]$ d) $(0\,,\ \pi)$

4. The number of all possible matrices of order 3 x 3 with each entry 0 or 1 is
a) 27 b) 18 c) 81 d) 512

5. Let A be a nonsigular matrix of order 3 x 3 and | adj A|= 25, thena possible value of |A| is
a) 625 b) 25 c) 5 d) 125

6. Which of the following x belongs to domain of the greatest integer function f(x) = [x] , 0 < x < 3 is not differentiable
a) 2 and 3 b) 1 and 2 c) 0 and 2 d) 1 and 3

7. If y = $\log_7 2x$, then $\frac{dy}{dx}$ is
1) $\frac{1}{x\ \log 7}$ b) $\frac{1}{7\ \log x}$
c) $\frac{\log x}{7}$ d) $\frac{7}{\log x}$

8. The point of inflection of the function y = x^3 is
a) (2, 8) b) (1, 1) c) (0, 0) d) (–3, -27)

9. $\int \sin 2x$ dx is
a) $-\frac{\sin 2x}{2}$ + c b) $-\frac{\cos 2x}{2}$ + c
c) $\frac{\cos 2x}{2}$ + c d) $\frac{\sin 2x}{2}$ + c

10. $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right)$ dx is
a) $e^{-x}\left(\frac{1}{x}\right)$ + c b) $e^{-x}\left(\frac{1}{x^2}\right)$ + c c) $e^{x}\left(\frac{1}{x}\right)$ + c d) $e^{x}\left(\frac{1}{x^2}\right)$ + c

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

a) 1 b)$\frac{1}{\sqrt{3}}$ c) $\sqrt{3}$ d) 0

12. Unit vector in the direction of $\vec{a} = 2\,\hat{\imath} + 3\,\hat{\jmath} + \hat{k}$ is

a) $\frac{2\,\hat{\imath}+3\,\hat{\jmath}+\hat{k}}{14}$ b) $\frac{2\,\hat{\imath}-3\,\hat{\jmath}+\hat{k}}{\sqrt{14}}$

c) $\frac{2\,\hat{\imath}+3\,\hat{\jmath}+\hat{k}}{\sqrt{14}}$ d) $\frac{2\,\hat{\imath}+3\,\hat{\jmath}-\hat{k}}{14}$

13. If the direction cosines l,m,n of a line are 0, $\frac{1}{2}$, $\frac{\sqrt{3}}{2}$then the angle made by the line with the positive direction of y – axis is

a) 60^0 b) 30^0 c) 90^0 d) 45^0

14. In a Linear programming problem , the objective function is always

a) a cubic function b) a quadratic function

c) a linear function d) a constant function

15. If A and B are two non empty events such that P (A/B) = P $(B/A)$and P(A∩B) ≠∅ then

a) A ⊂ B but A ≠ B b) A = B

c) B⊂ A but A≠ B d) P(A) = P(B)

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

$$\left(0,\quad 1,\quad 4,\quad \frac{1}{36},\quad 7,\quad \frac{1}{6}\right)$$

16. The value of sin$\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$is ______________________

17. A square matrix A is a singular matrix if |A| is ______________________

18. The order of the differential equation $\frac{d^4y}{dx^4}$+ sin (y^{III})= 0 is ______________

19. The lines $\frac{x\ -5}{k} = \frac{y\ +2}{-5} = \frac{z}{1}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular, then k is __________

20. The probability of obtaining an even prime number on each die, when a pair of dice is rolled is ____________________________

PART –B

Answer any six questions **6 x 2 =12**

21. Prove that $2\sin^{-1}\frac{3}{5} = \tan^{-1}\frac{24}{7}$

22. Find the equation of line joining (1, 2) , (3, 6) using determinant method

23. Find $\frac{dy}{dx}$, if y + siny = cosx

24. Find the rate of change of the area of a circle with respect to its radius r when r = 3 cm

25. Find the local minimum value of the function f given by f(x) = 3 + |x| , x ∈ R

26. Find $\int\frac{dx}{(x+1)(x+2)}$

27. Evaluate $\int_0^{\frac{\pi}{2}}\left(sin^2\frac{x}{2} - cos^2\frac{x}{2}\right)\,dx$

28. Find the projection of the vector $\vec{a} = 2\,\hat{\imath} + 3\,\hat{\jmath} + 2\hat{k}$ on the vector $\vec{b} = \hat{\imath} + 2\,\hat{\jmath} + \hat{k}$

29. Find the angle between the pair of lines given by
$\vec{r} = 3\hat{\imath} + 2\hat{\jmath} - 4\hat{k} + (\hat{\imath} + 2\hat{\jmath} + 2\hat{k})$ and $\vec{r} = 5\hat{\imath} - 2\hat{\jmath} + \mu(3\hat{\imath} + 2\hat{\jmath} + 6\hat{k})$

30. A fair die is rolled. Consider events E = {1, 3, 5 } , F = { 2, 3 } , find P (E/F)

31. If A and B two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{8}$,
find P (not A and not B)

PART – C

Answer any six questions **6 x 3 =18**

32. 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

33. Write in the simplest form $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$, $x \neq 0$

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

35. Differentiate $sin^2 x$ with respect to e^{cosx}

36. Differentiate x^{sinx} , x > 0 with respect to x

37. Find the interval in which the function $f(x) = 10 - 6x - 2x^2$ is strictly increasing

38. Find $\int x \sin^{-1} x \, dx$

39. Find the equation of curve passing through the point (–2, 3) , given that the slope of the tangent to the curve at any point (x, y) is $\frac{2x}{y^2}$

40. Show that the position vector of the 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 $\frac{m\vec{b} + n\vec{a}}{m+n}$

41. Find a unit vector perpendicular to each of the vectors $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$, where $\vec{a} = 3\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} - 2\hat{k}$

42. A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn at random from the bag and it is found to be red .Find the probability that the ballis drawn from first bag ?

PART – D

Answer any four questions **4 x 5 = 20**

43. Let f : N→ Y be a function defined as f(x) = 4x + 3, where Y = {y ∈ N : y = 4x + 3 for some x ∈ N}.Show that f is invertible. Find the inverse of f.

44. If $A = \begin{bmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix}$ then calculateAC, BC and (A + B)C. Also verify (A + B) C = AC + B C

45. Solve the system of linear equations by matrix method
$2x - 3y + 5z = 11$, $3x + 2y - 4z = -5$, $x + y - 2z = -3$

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

47. Find the integral of $\frac{1}{x^2 - a^2}$ with respect to x and hence evaluate $\int \frac{dx}{x^2 - 16}$

48. Find the area of the region bounded by the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ using integration.

49. Find the general solution of the differential equation

$x\frac{dy}{dx} + 2y = x^2 \log x$, $(x \neq 0)$

50. Derive the equation of a line in space through a given point and parallel to a vector both in the vector and Cartesian form

PART – E

Answer the following questions

51. P.T. $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx, & \text{if } f(x) \text{ is an even function} \\ 0 & \text{if } f(x) \text{ is an odd function} \end{cases}$

and hence evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x dx$ **6**

OR

Solve the following linear programming problem graphically

Minimise $Z = 200x + 500y$,

subject to the constraints : $x + 2y \geq 10$, $3x + 4y \leq 24$, $x \geq 0$, $y \geq 0$

52. Show that the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 4A + I = O$,

where I is 2 x 2 identity matrix and O is 2 x 2 zero matrix.

Using this equation, find A^{-1} . **4**

OR

Find the value of k so that the function $f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x} & \text{if } x \neq \frac{\pi}{2} \\ 3 & \text{if } x = \frac{\pi}{2} \end{cases}$

is continuous at $x = \frac{\pi}{2}$

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Time: 3 hours 15 minutes **MATHEMATICS (35)** **Max-Marks: 80**

INSTRUCTIONS:

1. *The question paper has five parts namely A, B, C, D & E. Answer all the parts.*
2. *Part A has 15 Multiple choice questions, 5 Fill in the blank's questions of 1 mark each*
3. *Use the graph sheets for the question on linear programming on PART-E.*

PART-A

I Answer all the multiple-choicequestions: $\mathbf{15 \times 1 = 15}$

1. A relation R in the set $\{1, 2, 3\}$ given by $R = \{(1, 2), (2, 1), (1, 1)\}$ is
   a) Transitive but not symmetric c) symmetric and transitive
   b) Symmetric but not transitive d) neither symmetric nor transitive
2. If $f : R \to R$ be defined as $f(x) = 2x$.Choose the correct answer
   a) f is one-one and onto c) f is one-one but not onto
   b) f is many-one and onto d) f is neither one-one nor onto
3. The principal value branch of $\sec^{-1} x$ is
   a) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ b) $[0, \pi]$ c) $[0, \pi] - \left\{\frac{\pi}{2}\right\}$ d) $(0, \pi)$
4. If A & B are symmetric matrices of same order then $AB - BA$ is a
   a) Skew symmetric matrix c) Zero matrix
   b) Symmetric matrix d) Identity matrix
5. If area of triangle is 35 $sq.units$with vertices $(2, -6), (5, 4), \&(k, 4)$, then k is
   a) 12 b) -2 c) $-12, -2$ d) $12, -2$
6. The function $f(x) = [x]$ is discontinuous at x is
   a) 1.5 b) 2.3 c) -3.5 d) 2
7. The derivative of $\cos^{-1} x$ exists in the interval
   a) $[-1,1]$ b) $(-1, 1)$ c) R d) $[0, \pi]$
8. The function $f(x) = cosx$ is increasing in the interval
   a) $\left(0, \frac{\pi}{2}\right)$ b) $(0, \pi)$ c) $\left(\frac{\pi}{2}, \pi\right)$ d) $(\pi, 2\pi)$
9. $\int \frac{e^x(1+x)}{cos^2(xe^x)} dx =$
   a) $cot(xe^x) + c$ b) $-cosec(xe^x) + c$ c) $tan(xe^x) + c$ d)$-tan(xe^x) + c$
10. $\int e^x \left(\tan^{-1} x + \frac{1}{1+x^2}\right) dx =$
    a) $\tan^{-1} x + c$ b) $e^x \tan^{-1} x + c$ c) $e^x \left(\frac{1}{1+x^2}\right) + c$ d) $\frac{1}{1+x^2} + c$
11. The value of $\hat{\imath} \cdot (\hat{\jmath} \times \hat{k}) + \hat{\jmath} \cdot (\hat{\imath} \times \hat{k}) + \hat{k} \cdot (\hat{\imath} \times \hat{\jmath})$ is
    a) 0 b) -1 c) 1 d) 3
12. The projection of vector $\hat{\imath} + \hat{\jmath}$ along $\hat{\imath} - \hat{\jmath}$ is
    a) 2 b) $\sqrt{2}$ c) 0 d) $\frac{1}{\sqrt{2}}$
13. A line makes equal angles with co-ordinate axis then direction cosines of the line are
    a) $\pm(1, 1, 1)$ b) $\pm\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ c) $\pm\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ d) $\pm\left(\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}\right)$
14. The common region determinant by all the constraints including non-negative constraints of a LPP is
    a) Feasible region b) feasible solution c) objective function d) optimal solution
15. If A and B are independent events then which of the following is incorrect.
    a) A & B' are independent c) A' & B' are independent
    b) A' & B are independent d) $P(A \cup B) = 1 + P(A')P(B')$

II Fill in the blanks by choosing the appropriate answers from those given in the bracket: $5 \times 1 = 5$

$\left(-1, \quad 3, \quad \frac{3}{25}, \quad 100, \quad \frac{1}{5}\right)$

16. If $sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$ then the value of x is ___________
17. If A is a matrix order 3 such that $A(adjA) = 10I$ then $|adjA|$ is __________
18. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + 2y = 0$ is_________
19. If a line makes angles α, β, γ with positive direction of coordinate axes then $cos2\alpha + cos2\beta + cos3\gamma =$ ________
20. If $P(A) = \frac{3}{5}$, $P(B) = \frac{1}{5}$ and A and B are independent events then $P(A \cap B)$ is _________

PART-B

Answer any six questions $6 \times 2 = 12$

21. Prove that $3\sin^{-1}x = \sin^{-1}(3x - 4x^3)$, $x \in \left[\frac{-1}{2}, \frac{1}{2}\right]$
22. Find the area of triangle with vertices $(2,7), (1,1)$ and $(10,8)$ using determinant method.
23. Find $\frac{dy}{dx}$, is $x = at^2$, $y = 2at$
24. Find $\frac{dy}{dx}$, if $y = \sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$, $0 < x < 1$
25. The radius of a circle is increasing uniformly at the rate of $3cm/s$. Find the rate at which the area of the circle is increasing when the radius is $10cm$.
26. Find $\int \frac{\sqrt{tanx}}{sinx\ cosx} dx$
27. Evaluate $\int_0^1 \frac{\tan^{-1}x}{1+x^2} dx$
28. Find the area ofparallelogram whose adjacent sides are given by the vectors $\vec{a} = 3\hat{\imath} + \hat{\jmath} + 4\hat{k}$ and $\vec{b} = \hat{\imath} - \hat{\jmath} + \hat{k}$
29. Find the angle between pairs of lines $\frac{x-2}{2} = \frac{y-1}{5} = \frac{z+3}{-3}$ & $\frac{x+2}{-1} = \frac{y-4}{8} = \frac{z-5}{4}$
30. A coin is tossed thrice. Consider events E: head on third toss F:heads on first two tosses. Find $P(E|F)$
31. A die is tossed thrice. Find the probability of getting an odd number at least once.

PART-C

Answer any six questions: $6 \times 3 = 18$

32. Let T be the set of all triangles in a plane with R as a relation in T given by $R = \{(T_1, T_2): T_1\ is\ congruent\ to\ T_2\}$. Show that R is an equivalence relation.
33. Express $\tan^{-1}\left(\frac{cosx}{1-sinx}\right)$, $\frac{-3\pi}{2} < x < \frac{\pi}{2}$ in the simplest form.
34. Express $A = \begin{bmatrix} 1 & 5 \\ -1 & 2 \end{bmatrix}$ as the sum of a symmetric and skew-symmetric matrix.
35. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$ for $-1 < x < 1$ then prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$
36. Differentiate $x^{sinx} + (sinx)^{cosx}\ w.r.to\ x$
37. Find the interval in which the function $f(x) = 6 - 9x - x^2$ is a) strictly increasing b) strictly decreasing
38. Find $\int \frac{x}{(x+1)(x+2)} dx$
39. Find the equation of a curve passing through the point $(-2,3)$ given that the slope of the tangent to the curve at any point (x,y) is $\frac{2x}{y^2}$
40. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$ then find the value of $\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a}$

41. Find the area of a triangle having the points $A(1,1,1)$, $B(1,2,3)$ and $c(2,3,1)$ as its vertices
42. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is six. Find the probability that it is actually a six.

PART-D

Answer any four questions $\mathbf{4 \times 5 = 20}$

43. Let $f: N \to Y$ be a function defined as $f(x) = 4x + 3$, where $Y = \{y \in N: y = 4x + 3 \text{ for some } x \in N$. Show that f is invertible. Find the inverse of f.
44. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}$ & $C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$ then compute $(A + B)$ and $(B - C)$ Also verify that $A + (B - C) = (A + B) - C$
45. Solve the system of linear equation by using matrix method $x - y + z = 4$, $2x + y - 3z = 0$, & $x + y + z = 2$
46. If $y = Ae^{mx} + Be^{nx}$, show that $\frac{d^2y}{dx^2} - (m+n)\frac{dy}{dx} + mny = 0$
47. Find the integral of $\frac{1}{\sqrt{a^2-x^2}}$ w. r. t-x and hence evaluate $\int \frac{1}{\sqrt{5-4x-x^2}} dx$
48. Find the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ using integration.
49. Find the general solution of the differential equation $ydx - (x + 2y^2)dy = 0$
50. Derive the equation of a line in a space through a given point and parallel to a vector both in vector and cartesian form.

PART-E

Answer the following questions

51. Prove that $\int_a^b f(x)dx = \int_a^b f(a+b-x)\,dx$ and hence evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt{tanx}} dx$

OR **6M**

Solve the linear programming problem graphically minimise $Z = 4x + y$ subject to the constraints $x + y \le 50, 3x + y \le 90,\ \ x \ge 0,\ \ y \ge 0$

52. Show that the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 5A + 7I = 0$, where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. Using this equation, find A^{-1}

OR **4M**

Find the value of K so that the function $f(x) = \begin{cases} Kx + 1, & x \le \pi \\ cosx, & x > \pi \end{cases}$ is continuous at $x = \pi$

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SECOND PUC MODEL QUESTION PAPER 2023 – 24

SUBJECT : MATHEMATICS – 35

TIME : 3Hours 15 Minutes **[Total Questions : 52]** **Max.Marks : 80**

Instructions :

1. The question paper has five parts namely A, B, C, D and E. Answer all the parts

2. Part A has15 multiple choice questions, 5 fill n the blanksquestion

3. Use the graph sheet for question on linear programming problem in part E.

Part – A

I. Answer all the multiple choice questions :

1. *The relation R in the set* $\{1,2,3,4\}$ *given by* $R = \{(1,2),(2,1)\}$ *is*

   a) *reflexive* b) *symmetric*

   c) *transitive* d) *equivalence*

2. *Let* $\boldsymbol{f}: \boldsymbol{R} \to \boldsymbol{R}$ *be defined as* $f(x) = 3x$. *Choose the correct answer.*

   a) f *is one – one onto.* b) f *is many – one onto.*

   c) f *is one – one but not onto.* d) f *is neither one – one but nor onto.*

3. *If* $\sin^{-1} x = y$ *, then*

   a) $0 \leq y \leq \pi$ b) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

   c) $0 < y < \pi$ d) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

4. $A = [a_{ij}]_{m \times n}$ *is a square matrix, if*

   a) $m < n$ b) $m > n$

   c) $m = n$ d) *None of these*

5. *Let A be a nonsingular square matrix of order* 3×3. *Then* $|adj A|$ *is equal to*

   a) $|A|$ b) $|A|^2$

   c) $|A|^3$ d) $3\,|A|$

6. $Differentiate\ \cos(\sqrt{x})$ with respect to x .

a) $\sin(\sqrt{x})$

b) $-\sin(\sqrt{x})$

c) $\frac{-\sin(\sqrt{x})}{2\sqrt{x}}$

d) $\frac{\cos(\sqrt{x})}{2\sqrt{x}}$

7. If $y = \sin(\log x)$,then $\frac{dy}{dx}$ is equal to .

a) $\frac{\sin(\log x)}{x}$

b) $\frac{\sqrt{1-y^2}}{y}$

c) $\frac{\sqrt{1-y^2}}{x}$

d) $\frac{\sqrt{1-x^2}}{x}$

8. The point of inflection of the function $y = x^3$ is .

a) $(2,8)$

b) $(0,0)$

c) $(-3,-27)$

d) $(1,1)$

9. $\int (\sin x + \cos x)\, dx$ equals to .

a) $\sin x - \cos x + C$

b) $\sin x + \cos x + C$

c) $\cos x - \sin x + C$

d) $-(\sin x + \cos x) + C$

10. $\int e^x (\frac{1}{x} - \frac{1}{x^2})\, dx$ equals to .

a) $\frac{e^x}{x^2} + C$

b) $xe^x + C$

c) $\frac{e^x}{x} + C$

d) $x^2 e^x + C$

11. The unit vector in the direction of the vector $\vec{a} = \hat{\imath} + \hat{\jmath} + 2\hat{k}$.

a) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{4}$

b) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{\sqrt{6}}$

c) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{2}$

d) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{6}$

12. The value of $\hat{\imath}.(\hat{\jmath} \times \hat{k}) + \hat{\jmath}.(\hat{\imath} \times \hat{k}) + \hat{k}.(\hat{\imath} \times \hat{\jmath})$ is

a) 0

b) -1

c) 1 d) 3

13. *The direction cosines of x − axis is*

a) 0,1,1 b) 1,1,1

c) 1,0,1 d) 1,0,0

14. *In a linear programming problem, the objective function is always*

a) *Cubic function* b) *Quadratic equation*

c) *Linear function* d) *constant function*

15. If $P(F) = 0.3$ and $P(E \cap F) = 0.2$, then $P(E|F)$ is.

a) $\frac{3}{2}$ b) $\frac{5}{2}$

c) $\frac{2}{3}$ d) $\frac{1}{3}$

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket: $\left(\frac{70}{11}, -24, 1, \quad 0, \; 2, \frac{2\pi}{3}\right)$ **$5 \times 1 = 5$**

16. The principal value of $\cot^{-1}\left(\frac{-1}{\sqrt{3}}\right)$ is ____________________

17 If $A = \begin{pmatrix} 1 & 2 \\ 4 & 2 \end{pmatrix}$, then $|2A|$ is equal to ____________________

18. *The order of the differential equation* $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ *is* __________

19. If the lines $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$ are at right angles the value p is ______________________________.

20. Let E and F be events of a sample space S of an exeriment, then $P(S|F)$ is __________

Part – B

Answer any six questions **$6 \times 2 = 12$**

21. Show that $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x$, $-\frac{1}{\sqrt{2}} \le x \le \frac{1}{\sqrt{2}}$

22. Find the equation of the line joining (1,2) and (3,6) using determinants.

23. Find $\frac{dy}{dx}$, if $x = a(\theta + sin\theta)$, $y = a(1 - cos\theta)$.

24. The radius of a circle is increasing at the rate of $0.7 cm/s$. What is the rate of increase of its circumference?.

25. Find the intervals in which the function f given by $f(x) = x^2 - 4x + 6$ is

a) increasing b) decreasing

26. Find $\int \frac{1}{x - \sqrt{x}} dx$.

27. Integrate $x sec^2 x$ with respect to x.

28. Find the angle between the vectors $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$.

29. Find the distance between the lines l_1 and l_2 given by

$\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$ and $\vec{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu(2\hat{i} + 3\hat{j} + 6\hat{k})$

30. Let A and B be independent events with $P(A) = 0.3$ and $P(B) = 0.4$

Find a) $P(A \cap B)$ b) $P(B|A)$

31. Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are black.

. **Part – C**

Answer any six questions **6 × 3 = 18**

32. Let L be the set of all lines in a plane and R be the relation in L defined as $R = \{(L_1, L_2) : L_1 \text{ is perpendicular to } L_2\}$. Show that R is symmetric but neither reflexive nor transitive.

33. Write $\tan^{-1}\left(\frac{\sqrt{1+x^2} - 1}{x}\right)$, $x \neq 0$ in the simplest form.

34. Express the matrix $B = \begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$ as the sum of a symmetric and a skew – symmetric matrix.

35. Differentiate $(sinx)^x + \sin^{-1}\sqrt{x}$ with respect to x.

36. If $x^2 + xy + y^2 = 100$, Find $\frac{dy}{dx}$

37. Find the local maximum and local minimum values of the function f given by $f(x) = x^3 - 3x$.

38. Integrate $\frac{x}{(x+1)(x+2)}$ with respect to x.

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

40. *Show that the position vector of the point R, which divides the line joining the points P and Q with position vectors* $\vec{a}$ *and* $\vec{b}$ *internally in the ratio m:n is* $\frac{m\vec{b} + n\vec{a}}{m+n}$

41. *Find the area of a triangle having the points* $A\ (1,1,1), B\ (1,2,3)$ *and* $C\ (2,3,1)$ *as its vertices. In vector method.*

42. *Bag I contains 3 red abd 4 black balls while another Bag II contains 5 red and 6 black balls. One ball is drawn at random fromone of the bags and it is found to be red. Find the probality that it was drawn from bag II.*

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Part – D

Answer any four questions **$4 \times 5 = 20$**

43. *Let* $f: N \to Y$ *be a function defined as* $f(x) = 4x + 3$, *where* $Y = \{y \in N : y = 4x + 3 \text{ for some } x \in N\}$ *Show that f is invertible. Find th inverse.*

44. *If* $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}, C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$ *then compute* $(A + B)$ *and* $(B - C)$. *Also, verify* $A + (B - C) = (A + B) - C$.

45. *Solve the following system of equations by matrix method.*

$3x - 2y + 3z = 8$

$2x + y - z = 1$ *and*

$4x - 3y + 2z = 4$

46. *If* $y = 3e^{2x} + 2e^{3x}$, *prove that* $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$.

47. *Find the integral of* $\frac{1}{x^2 - a^2}$ *with respect to x and hence evaluate* $\frac{1}{x^2 - 16}$.

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

49. *Find the general solution of the differential equation* $x\frac{dy}{dx} + 2y = x^2 (x \neq 0)$.

50. *Derive the equation of a line through a point and parallel to a given vector both in the vector and cartesian form.*

Part – E

Answer any the following questions **$6 \times 2 = 12$**

51. *Prove that* $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ *and hence evaluate* $\int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}dx$

OR

Solve the following linear Programming Problem graphically:

Maximise $Z = 3x + 2y$

Subject to $x + 2y \leq 10$,

$3x + y \leq 15$,

$x, y \geq 0$.

52. *If* $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ *, show that* $A^2 - 5A + 7I = O$*. where* I *is* 2×2 *identity matrix and* O *is* 2×2 *zero matrix. Using this equation find* A^{-1}.

OR

Find the value of k *so that the function* f *defined by*

$f(x) = \begin{cases} kx^2, & \text{if } x \leq 2 \\ 3, & \text{if } x > 2 \end{cases}$ *is continuous at* $x = 2$

SECOND PUC MODEL QUESTION PAPER

TIME : 3 Hr 15 Min **SUBJECT : MATHEMATICS (35)** **MAX MARKS : 80**

Instructions :-

1) The question paper has time parts namely A, B, C, D and E. Answer all parts
2) Part A has 15 multiplechoice questions, 5 fill in the blanks questions.
3) Use the graph sheet for question on linear programming problem in part E

Part -A

I) Answer all the multiple choice questions **15 X 1 = 15**

1) Let L denote the set of all straight lines in a plane, let a relation R be defined by lRm if and only if 'l' is perpendicular to m, ∀ l, m∈L Then R is

A) reflexive B) Symmetric C) Transitive D) None of these

2) If f : R → R defined by f(x) =3x, then

A) f is one - one onto B) f is many - one onto

C) f is one - one but not onto D) f is neither one - one nor onto

3) If $\sin^{-1}x=y$ then

A) $0 \leq y \leq \pi$ B) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$

C) $0 < y < \pi$ D) $\frac{-\pi}{2} < y < y\frac{\pi}{2}$

4) If a matrix has 8 elements, then the number of possible orders it can have is

A) 8 B) 0 C) 4 D) 1

5) Let A be a nonsingular matrix of order 3x3 and ladj Al = 25, them a possible value of lAl is

A) 625 B) 25 C) 5 D) 125

6) Which of the following is a continuous function, $\forall x \in R$

A) sinx B) cos (x^2) C) |cosx| D) All of the above

7) If $x = t^2$ $y = t$ then $\frac{dy}{dx}$ is

A) 1 B) 2t C) $\frac{1}{2t}$ D) t

8) Which of the following function is decreasing on $(0, \frac{\pi}{2})$

A) sinzx B) tanx C) cosx D) cos3x

9) $\int \frac{10x^9 + 10^x \log_e 10}{x^{10} + 10^x} dx$ equals

A) $10^x - x^{10} + c$ B) $10^x + x^{10} + c$

C) $(10^x - x^{10})^{-1}$ D) $\log (10^x + x^{10})+c$

10) The antiderivative of $\sqrt{x} + \frac{1}{x}$ is

A) $\frac{2}{3}$ x $\frac{3}{2}$ _ log + c B) $\frac{3}{2}$x + logx + c

C) $\frac{1}{2\sqrt{x}}$ - $\frac{1}{x^2}$ D) None of these

11) The direction cosines of the vector $\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ are

A) $\frac{1}{\sqrt{14},}\frac{2}{\sqrt{14},}\frac{31}{\sqrt{14},}$ B) 1,2,3

C) (-1,-2,-3) D) $\frac{-1}{\sqrt{14},},\frac{3}{\sqrt{14},}\frac{6}{\sqrt{14},}$

12) Angle between two vectors $\vec{a}.$ $and\ \vec{b}$ with magnitude $\sqrt{3}$ and 2 respectively having $\vec{a}.\vec{b} = \sqrt{6}$ is

A) 0 B) $\frac{\pi}{3}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{2}$

13) The direction cosines of x, axis are

A) (0,0,1) B) (0,1,8) C) (1, 1, 1) D) (1, 0,0)

14) All the points within and on the boundary of the feasible region represent

A) Feasible solutions B) Optional Solution

C) Infesible solution D) All of the above

15) If p(A) = $\frac{1}{2}$, P(B) = 0 then P (A/B) is

A) 0 B) $\frac{1}{2}$ C) not defined D) 1

II) Fill in the blanks by choosing the appropriate answer from those given in the bracket

(0, 2, 3, $\frac{1}{2}$, $\frac{3}{25}$, 1)

16) The value of $\sin\left[\frac{\pi}{3} - sin^{-1}\left(\frac{-1}{2}\right)\right]$ is _______

17) A matrix of order 2x3 has _______ rows

18) The order of the differential equation $\left(\frac{d^3y}{dx^3}\right)^{2} + \left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y^5 = 0$ is ______

19) If a line makes an angle of 60^0 with the positive direction of y axis then its direction cosine along y axis is______

20) If A and B are independent events with P(A) = 0.3 and P(B)=0.4 then P(A∩B) is_____

Part B

III) Answer any six questions. **6x2=12**

21) Prove that $\sin^{-1}(2x\sqrt{1-x^2}) = 2\sin^{-1} x$ for $\frac{-1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$

22) If the area of the triangle with vertices, (~2,0), (0, 4) and (0,k) as 4 squer units, find the values of k, using determinants.

23). Find $\frac{dy}{dx}$ if $ax + by^2 = \cos y$

24). A stone is dropped into a quiet lake and waves move in circles at the speed of 5cm/sec. At the instant, when the radius of the circular wave is 8 cm, how fast is the enclosed area increasing?

25) Prove that the functions $f(x) = e^x$ do not have maxima or minima. for any $x \in R$.

26) Evaluate $\int \frac{dx}{x-\sqrt{x}}$

27) Evaluate $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right)$ dx.

28) Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a}$= i - j+3k and $\vec{b}$ = 2i- 7j+k

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

30) Mother, father and son lie up at random up for a family picture. Find P(E/F) where E : son an one end, F : Father in middle.

31) Evaluate P(AUB) if 2 P(A) = P(B) = $\frac{5}{13}$ and P(A|B) = $\frac{2}{5}$

Part C

IV) Answer any six questions **6x3=18**

32) Prove that the relation R in the set of integers I defined by R = {(x,y): x-y integer} is an equivalence relation

33) Write $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right)$ $-\frac{\pi}{2} < x < \frac{3\pi}{2}$ in simplest form.

34) If A and B are symmetric matrices of the same order then show that AB is symmetric iff AB=BA.

35) Find $\frac{dy}{dx}$ if $x = a\sec\theta$, $y = b\tan\theta$

36) Differentiate $(\log x)^{\cos x}$ with respect to x.

37) Find the intervals in which the function $f(x) = x^2 - 4x + 6$ is a) strictly increasing b) strictly

decreasing.

38) Find $\int e^{x}\sin x\, dx$.

39) Verify that the function y = acosx+bsinx where a, b ∈ R is a solution of the differential eqution $\frac{d^2 y}{dx^2} + y = 0$

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

41) Find a unit vector perpendicular to each of the vectors $(\vec{a} + \vec{b})$ and $\vec{a} - \vec{b}$.

where $\vec{a} = \hat{\imath} + \hat{\jmath} + \hat{k}, \vec{b} = \hat{\imath} + \widehat{2j} + \widehat{3k}$

42) 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

v) Answer any four questions **4 X 5 = 20**

43) Let f:N → Y be a fuction defined as f(x) = 4x + 3, where y = { y ∈ N : y = 4x + 3 for sum x ∈ N}.

Show that f is invertible. Find the inverse of f.

44) If A = $\begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}$ B = $\begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}$ and C = $\begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$, then compute (A+B) and (B - C).

Also verify A+(B-C) = (A+B) - C

45) Solve the system of equations by matrix method. 3x - 2y + 3z = 8, 2x + y - z = 4, 4x - 3y + 2z = 4

46) If $y = (\tan^{-1}x)^2$ Show that $(x^2+1)^2 y_2 + 2x\,(x^2 + 1)\, y_1 = 2$

47) Find the integral of $\frac{1}{x^2+a^2}$ with respect to x and hence find $\int \frac{1}{x^2-6x+13}\, dx$

48) Find the area of enclosed by the circle $x^2 + y^2 = a^2$ using integration.

49) Find the general solution of the differential equation $\cos^2 x \frac{dy}{dx} + y = \tan x$ $(0 \le x \le \frac{\pi}{2})$

50) Derive the equation of a line in space through a given point and parallel to a vector both in vector and Cartesian form

PART - E

51) Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ and hence evaluate $\int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}\, dx$ 6

OR

Solve the following linear programming problem graphically.

Maximise and Minimise, Z = 3x + 9y subject to the constraints x+3y ≤ 60, x+y≥10, x≤y, x,y ≥0

52) Find the value of k if f(x) = $\begin{cases} kx^2 & if\ x \le 2 \\ 3 & if\ x > 2 \end{cases}$ is continuos at x=2 **4**

OR

If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 5A + 7I = 0$ where I is 2 x 2 identity matrix and 0 is 2 x 2 zero matrix. Using this equation find A^{-1}

SECOND PUC MODEL QUESTION PAPER - 2023-24

SUB: MATHEMATICS (35)

TIME: 3 hrs 15 min **MAX MARKS: 80**

Instructions : 1) The question paper has five parts namely A,B,C,D and E. Answer all parts.

2) part A has multiple choice questions, 5 fill in the blanks.

3)Use the graph sheet for questions on linear programming problem.

PART – A

I. Answer ALL multiple choice questions **15x1=15**

1) Let R be the relation in the set {1,2,3,4} given by R={(1,2),(2,2) (1,1) (4,4) (1,3) (3,3) (3,2)}. Choose the correct answer
   A) R is reflexive and symmetric but not transitive.
   B) R is reflexive and transitive but not symmetric.
   C) R is symmetric and transitive but not reflexive
   D) R is an equivalence relation.

2) The function $f: R \to R\ defined\ by\ f(x) = \begin{cases} 1, & x > 0 \\ 0, & x = 0 \\ -1, & x < 0 \end{cases}$ is
   A) One-one and onto
   B) Manyone and onto
   C) One-one but not onto
   D) Neither one-one nor onto

3) The principle value branch of $\tan^{-1} x$ is
   A) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ B) $(0, \pi)$ C) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$D) $[0, \pi]$

4) If matrix has 13 elements then the total number of possible orders it can have is
   A) 3 B) 2 C) 1 D) 8

5) Let A be a nonsingular matrix of order 3x3 then IadjAI is equal to
   A) IAI B) $|A|^2$ C)$|A|^3$ D) 3IAI

6) The function f(x)=Ix-1I , x∈R is not differentiable at x=
   A) -1 B) 1 C) 0 D) 2

7) If $y = e^{\log x}$ then $\frac{dy}{dx}$ is
   A) x B) 0 C) 1 D) 2x

8) The point on the curve $x^2 = 2y$ which is nearest to the point (0,5) is
   A) $(2\sqrt{2}, 4)$ B)$(2\sqrt{2}, 0)$ C) (0,0) D) (2,2)

9) If $\frac{d}{dx}\left(f(x)\right) = 4x^3 - \frac{3}{x^4}$ such that f(2)=0 then f(x) is
   A) $x^4 + \frac{1}{x^3} - \frac{129}{8}$ B)$x^3 + \frac{1}{x^4} - \frac{129}{8}$ C) $x^4 + \frac{1}{x^3} + \frac{129}{8}$ $D)$ $x^3 + \frac{1}{x^4} - \frac{129}{8}$

10) $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx$ is
   A)$e^{-x}\left(\frac{1}{x}\right) + c$ B) $e^{-x}\left(\frac{1}{x}\right) + c$ C)$e^x\left(\frac{1}{x}\right) + c$ D) $e^x\left(\frac{1}{x^2}\right) + c$

11) If $\vec{a}$ is non-zero vector of magnitude 'a' and 'λ' a nonzero scalar then$\lambda\vec{a}$is unit vector if

A) $\lambda = 1$ B) $\lambda = -1$ C)$a = I\lambda I$ D) $a = \frac{1}{|\lambda|}$

12) If for a unit vector $\vec{a}, (\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 12$ then $|\vec{x}|$ is

A) $\sqrt{12}$ B) $\sqrt{13}$ C)$\sqrt{15}$ D) $\sqrt{2}$

13) If a unit vector $\vec{a}$ makes angles $\frac{\pi}{3}$ with i , $\frac{\pi}{4}$ with j and θ with k then θ is equal to

A) $\frac{\pi}{2}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{6}$

14) In a linear programming problem the linear function Z=ax+by, where a and b are constants which has to be maximized or minimized is called a

A) Cubic function B) constraint C) objective function D) a constant function

15) If A and B are two events such that A⊂B and P(B)$\neq$ 0 then which of the following is correct

A) P(A/B)=$\frac{P(B)}{P(A)}$ B) P(A/B)< P(A) C) P(A/B)≥P(A) D) None of these

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket

(2, -5, $\frac{25}{102}$, 1, 3, $\frac{1}{36}$) 5x1=5

16) The Value of $Sin[\frac{\pi}{3} - \sin^{-1}\left(\frac{-1}{2}\right)]$ is _______.

17) If $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$ then x=____.

18) The order of the differential equation $\frac{d^3x}{dx^3}+\frac{d^2x}{dx^2}+\frac{dy}{dx}=0$ is _______.

19) The lines $\frac{x-5}{7} = \frac{y+2}{k} = \frac{z}{1}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular then k=_____.

20) Two cards are drawn at random and without replacement fro m a pack of 52 playing cards then the probability that both cards are black is _______.

PART- B

Answer any SIX of the following questions **6x2=12**

21) Show that $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x$.

22) Find the area of triangle whose vertices are (2,0) , (-1,0) and (0,3) by using the determinants.

23) Find $\frac{dy}{dx}$ if 2x+3y=Sin y .

24) The radius of a circle is increasing at the rate of 0.7 cm/s. What is the rate of increase of its circumference.

25) Find the local maximum value of the function $f(x) = x^3 - 3x$.

26) Evaluate $\int \frac{Sin^2x - Cos^2x}{Sin^2x Cos^2x} dx$.

27) Evaluate $\int_0^{\frac{\pi}{4}}(2Sec^2x + x^3 + 2)dx$.

28) Find the projection of the vector $\vec{a} = i + 3j + 7k$ $on\ the\ vector\ \vec{b} = 7i - j + 8k$.

29) Find the angle between the pair of lines given by $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$.

30) A family has two children. What is the probability that both the children are boys given that atleast one of them is a boy?

31) Given two independent events A and B such that P(A)=0.3, P(B)=0.6 then find P(A and not B).

PART-C

Answer any SIX questions **6x3=18**

32) Show that the relation R defined in the set A of all triangles as $R = \{(T_1, T_2): T_1\ is\ similar\ to\ T_2\}$ is an equivalence relation.

33) Write $\tan^{-1}\left(\frac{Cos\ x - Sin\ x}{Cos\ x + Sin\ x}\right), \frac{\pi}{4} < x < \frac{3\pi}{4}$ in the simplest form.

34) Express A=$\begin{bmatrix} 1 & 5 \\ -1 & 2 \end{bmatrix}$ as the sum of symmetric and skew-symmetric matrix.

35) Find $\frac{dy}{dx}$, if $x = a(\theta + Sin\theta)\ and\ y = a(1 - Cos\theta)$.

36) Differentiate $x^{Sin\ x}$, x>0 with respect to x.

37) Find the interval in which the function f(x)=$x^2 - 4x + 6$ is strictly increasing.

38) Evaluate $\int e^x Sin\ x\ dx$.

39) Solve ylogy dx-x dy=0.

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

41) Find a unit vector perpendicular to each of the vectors $(\vec{a} + \vec{b})\ and\ (\vec{a} - \vec{b})$ where $\vec{a}$=i+j+k and $\vec{b}$= i+2j+3k.

42) 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-D

Answer any FOUR of the following **4x5=20**

43) Let $f: N \rightarrow Y$ be a function defined as f(x)= 4x+3 where Y={y4x+3 for some x∈ N}. Show that f is invertible. Find the inverse of f.

44) If $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & 0 & 3 \\ 3 & -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ -1 & 4 \end{bmatrix}$ $C = \begin{bmatrix} 1 & 2 & 3 & -4 \\ 2 & 0 & -2 & 1 \end{bmatrix}$ then show that (AB)C= A(BC).

45) Solve the following system of equations by matrix method 3x-2y+3z=8, 2x+y-z=1, 4x-3y+2z=4

46) If $y = (\tan^{-1} x)^2$ then show that $(1 + x^2)^2 y_2 + 2x(1 + x^2)y_1 = 2$.

47) Find the integral of $\frac{1}{x^2-a^2}$ with respect to x and hence evaluate $\int \frac{1}{4x^2-9} dx$.

48) Using the method of integration find the area enclosed by the circle $x^2 + y^2 = a^2$.

49) Find the general solution of the differential equation $x\frac{dy}{dx} + 2y = x^2,\ (x \neq 0)$.

50) Derive the equation of the line in space passing through a given point and parallel to a given vector both in vector form and Cartesian form.

PART-E

Answer the following questions

51) Prove that

$$\int_{-a}^{a} f(x)\, dx = \begin{cases} 2\int_0^a f(x)dx, & if\ f(x) is\ even \\ 0, & if\ f(x)\ is\ odd \end{cases} and\ hence\ evaluate\ \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} tan^9 x\, dx$$

OR

Maximise Z=4x+y subject to constraints $x + y \leq 50,\ 3x + y \leq 90,\ x \geq 0,\ y \geq 0$ graphically

(6)

52) Show that the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 5A + 7I = O$ then find the inverse of A using this equation where I is the identity matrix of order 2.

OR

Find the value of K if $f(x) = \begin{cases} Kx + 1, & if\ x \leq \pi \\ Cos\ x, & if\ x > \pi \end{cases}$ is continuous at x=π. (4)

ಕರ್ನಾಟಕ ಸರ್ಕಾರ

ಉಪನಿರ್ದೇಶಕರ ಕಛೇರಿ, ಶಾಲಾ ಶಿಕ್ಷಣ ಇಲಾಖೆ(ಪದವಿ ಪೂರ್ವ) ಧಾರವಾಡ ಜಿಲ್ಲೆ

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ಸಂಖ್ಯೆ:ಪಪೂಶಿಇ/ಉನಿಧಾ/ವಿಷಯವಾರು ಅಸೈನ್ಮೆಂಟ್/2023-24 ದಿನಾಂಕ: 11-10-2023.

ಜ್ಞಾಪನ

ವಿಷಯ: 2023-24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಪ್ರಥಮ ಮತ್ತು ದ್ವಿತೀಯ ಪಿಯುಸಿ ಪ್ರಾಯೋಗಿಕ ಪರೀಕ್ಷೆ ಹೊಂದಿರದ ವಿಷಯಗಳಿಗೆ 20 ಅಂತರಿಕ ಅಂಕಗಳನ್ನು ನೀಡಲು ಧಾರವಾಡ ಜಿಲ್ಲೆಯ ವಿವಿಧ ವಿಷಯಗಳ ಉಪನ್ಯಾಸಕರ ವೇದಿಕೆಯಿಂದ ಪ್ರಾಜೆಕ್ಟ್ ಅಥವಾ ಅಸೈನ್ಮೆಂಟ್‌ಗಳ ಶೀರ್ಷಿಕೆಗಳನ್ನು ಅನುಮೋದಿಸಿ ಕಳುಹಿಸುವ ಕುರಿತು

ಉಲ್ಲೇಖ: ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಪಿ 40 ಟಿಪಿಯು 2023 ಬೆಂಗಳೂರು ದಿನಾಂಕ:10/07/2023

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ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ, 2023-24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಪ್ರಥಮ ಮತ್ತು ದ್ವಿತೀಯ ಪಿಯುಸಿ ಪ್ರಾಯೋಗಿಕ ಪರೀಕ್ಷೆ ಹೊಂದಿರದ ವಿಷಯಗಳಿಗೆ 20 ಅಂತರಿಕ ಅಂಕಗಳನ್ನು ನೀಡಲು ಉಲ್ಲೇಖಿತ ಸರ್ಕಾರದ ನಡಾವಳಿಯಲ್ಲಿ ಆದೇಶಿಸಿರುತ್ತಾರೆ. ತತ್ಸಂಬಂಧವಾಗಿ ಧಾರವಾಡ ಜಿಲ್ಲೆಯ ವಿವಿಧ ವಿಷಯಗಳ ಉಪನ್ಯಾಸಕರ ವೇದಿಕೆಯಿಂದ ಹಿರಿಯ ಉಪನ್ಯಾಸಕರನ್ನೊಳಗೊಂಡ ಸಮಿತಿಯು ಸಿದ್ಧಪಡಿಸಿ ಸಲ್ಲಿಸಿರುವ ಪ್ರಾಜೆಕ್ಟ್ ಅಥವಾ ಅಸೈನ್ಮೆಂಟ್‌ಗಳ ಶೀರ್ಷಿಕೆಗಳನ್ನು ಉಪನಿರ್ದೇಶಕರಿಂದ ಅನುಮೋದಿಸಲಾಗಿದೆ.

ಜಿಲ್ಲೆಯ ಪ್ರಾಂಶುಪಾಲರು ಪ್ರಾಯೋಗಿಕ ಪರೀಕ್ಷೆ ಹೊಂದಿರದ ವಿಷಯಗಳನ್ನು ಅಭ್ಯಸಿಸುತ್ತಿರುವ ಪ್ರಥಮ ಮತ್ತು ದ್ವಿತೀಯ ಪಿಯುಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಉಪನ್ಯಾಸಕರ ಮೂಲಕ ಉಪನಿರ್ದೇಶಕರಿಂದ ಅನುಮೋದಿಸಿರುವ ಶೀರ್ಷಿಕೆಗಳನ್ನು ಮಾತ್ರ ಪ್ರಾಜೆಕ್ಟ್ ವರ್ಕ್‌ಗಳಿಗೆ ನೀಡುವುದು. ವಿದ್ಯಾರ್ಥಿಗಳು ಮಧ್ಯಂತರ ರಜೆಯಲ್ಲಿ ಅಸೈನ್ಮೆಂಟ್‌ಗಳನ್ನು ಪೂರ್ಣಗೊಳಿಸಲು ತಿಳಿಸುವುದು. ತತ್ಸಂಬಂಧ ತಾಲೂಕುವಾರು ಪರಿಶೀಲನಾ ತಂಡಗಳನ್ನು ರಚಿಸಲಾಗಿದ್ದು, ಈ ತಂಡವು ಭೇಟಿ ನೀಡಿದಾಗ ವಿದ್ಯಾರ್ಥಿಗಳು ನೀಡಿರುವ ಅಸೈನ್ಮೆಂಟ್‌ಗಳನ್ನು ಹಾಗೂ ಕ್ರೋಢೀಕೃತ ಅಂಕವಹಿಯಲ್ಲಿ ಅಂಕಗಳನ್ನು ನಮೂದಿಸಿರುವುದನ್ನು ಪರಿಶೀಲಿಸಲಾಗುವುದು. ಈ ಸಂಬಂಧ ಪ್ರಾಂಶುಪಾಲರು SATS ಪೋರ್ಟಲ್‌ನಲ್ಲಿ ಅಂಕಗಳನ್ನು ನಮೂದಿಸಬೇಕು ಮತು ನಮೂದಾಗಿರುವುದನ್ನು ಖಚಿತಪಡಿಸಿಕೊಳ್ಳಲು ಅಗತ್ಯ ಚೆಕ್‌ಲಿಸ್ಟ್ ದಾಖಲೆಗಳನ್ನು SATS ಪೋರ್ಟಲ್‌ನಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಬೇಕು. ನಂತರ ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಅಸೈನ್ಮೆಂಟ್‌ಗಳನ್ನು ಸುರಕ್ಷಿತವಾಗಿ ಅಭಿರಕ್ಷಿಸುವುದು ಪ್ರಾಂಶುಪಾಲರ ಆದ್ಯ ಕರ್ತವ್ಯವಾಗಿರುತ್ತದೆ.

11.10.2023
ಉಪ ನಿರ್ದೇಶಕರು,
ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣ ಹಾಗೂ
ವೃತ್ತಿ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಧಾರವಾಡ.

ಗೆ,

ಜಿಲ್ಲೆಯ ಎಲ್ಲಾ ಪದವಿಪೂರ್ವ ಕಾಲೇಜುಗಳ ಪ್ರಾಂಶುಪಾಲರಿಗೆ
ಮತ್ತು ಉಪನ್ಯಾಸಕರಿಗೆ- ಅಗತ್ಯ ಕ್ರಮಕ್ಕಾಗಿ

ಪ್ರತಿಯನ್ನು: ಮಾನ್ಯ ನಿರ್ದೇಶಕರು, ಶಾಲಾ ಶಿಕ್ಷಣ ಇಲಾಖೆ (ಪದವಿಪೂರ್ವ) ಬೆಂಗಳೂರು ಇವರಿಗೆ ಗೌರವಪೂರ್ವಕವಾಗಿ ಸಲ್ಲಿಸಿದೆ

Dharwad District Mathematics Lecturers Forum 2023-2024
I PUC Mathematics Assignment And Project List.

1. Aryabhata: the mathematician and astronomer.
2. Surface areas and volume of cuboid?
3. π- worlds most mysterious number as application of algebra in day to day life.
4. Application of geometry in day to day life. Application off mensuration in day today life.
5. Magic squares.
6. Extension of pythogorous theorem
7. Chronology of indian mathematician with their contributions.
8. Graphs of trigonometric functions.
9. Graphs of identity function, constant function, modulus function, signum function and greatest integer function.
10. To interpret geometrically the meaning of i = - 1 and its integral power.
11. Find the value of r if $^{50}p_{r+1} : {}^{52}p_{r+2} = 2: 221$.
12. Plot the graph of sinx sin2x sin3x & $\sin^2 x$ in a plane.
13. Write the contributions of great indian mathematician.
14. Construct a pascals triangle and write binomial expansion for a given positive Integral exponent.
15. Write the sample spaces for i) tossing a coin once ii) twice iii) thrice similar for throwing die i) once ii) twice iii)thrice.
16. Representing two given intersected simultaneous linear equationsin graph ,find the angle between them by using $\tan\theta = \left|\frac{m_2 - m_1}{1 + m_1 m_2}\right|$ also find the point of intersection by using matrix method .

<u>Project work based questions</u>

17. Draw the graph for the following functions
 1) $\log_x$ ii) e^x iii) 1/x iv) |x| v) sinx vi) tanx
18. Construct relations on a set to show that reflexive. Symmetric and transitive are independent.
19. i) identify that the three given points are collinear. ii) find the equation of the common line find the scope of line. iii) find the slope of line. iv) find the intercept of line. v) find the area made by the line with the co - ordinate axes.

20. i) Prove by mathematical induction that 6 divides n(n+1)(2n+1)
 ii) Prove by mathematical induction that 5 divides $4^{2n} - 1$
 iii) Prove by mathematical induction that n^{th} terms of a, a+d, a+ 2d , - --- - is a +(n-1)d.

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Dharwad District Mathematics Lecturers Forum 2023-2024
II PUC Mathematics Assignment And Project List

1 . Mathematics and environment.
2. Mathematics and music.
3. Mathematics and chemistry.
4. Graphs of inverse trigonometric functions with range and domain.
5. Applications of matrices in our daily life.
6. Applications of derivatives in physics.
7. Applications of matrices in economics.
8. Draw the graph of e^x and logx in the same graph, show that they are symmetric about the line y=x,using a points on the curve and by drawing perpendicular to both curves.
9. Give brief introduction of mathematician A.M. Kolmogerov with his photo explain his contribution to probability .
10. By using the graph of greatest integer function discuss the points of discontinuity .
11. Draw the graph of the function $f(x) = (2x -1)^2 + 3$ With the help of the graph find maximum and minimum value of the function. Verify those values using differentiation.
12. In a bank principal increases continuously at the wake of 5 % per year . An amount of Rs 1000 is deposited with this bank, using differential equations solving method find how much will it worth after 10 years (use $e^{0.5} = 1.648$). Verify if with calculating principal amount for every year manually.
13. Consider function f: [0, π/ 2] - >R given by f(x) = sinx and g: [0, π/ 2] - >R given by g(x) = cos(x). Show graphically that f and g are one -one, but f+g is not one- one .
14. Problems using scalar product, vector product and direction cosines.
    i) if α,β, γ are angles made by a vector with ox , oy and oz then calculate
    a) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ b) $\cos^2\alpha + \cos^2\beta + \cos^2\gamma$

15) i)Recognise mathematical concepts in nature.
ii) Geometrical equivalence for given algebraic equations .

Activity 1. To verify that the relation R in the set of all lines in a plane, defined by
$R = \{(l, m) : l \perp m\}$ is symmetric but neither reflexive nor transitive.

Activity2. To verify that the relation R in the set of all lines in a plane, defined by
$R = \{(l, m) : l \parallel m\}$ is an equivalence relation.

Activily 3. To explore the principal value of the function $\sin^{-1}x$ using a unit circle .

Activity 4. To establish a relationship between common logarithm (to the base 10) and Natural logarithm (to the base e) of the number x .

Activity 5. To verify that for function f to be continuous at given point x_0 , $\Delta y = |f(x_0 + \Delta x) - f(x_0)|$ Is arbitrarily small provided Δx is sufficiently small .

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