BOARD OF INTERMEDIATE EDUCATION:: ANDHRA PRRADESH
MODEL QUESTION PAPER (w.e.f IPE 2027)
MATHEMATICS – II

TIME: 3 Hrs **Max Marks: 100**

Section – A

I. Answer all the questions. **12 X 1 = 12**
Each question carries one marks

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.
   1) R is reflexive and symmetric but not transitive.
   2) R is reflexive and transitive but not symmetric.
   3) R is symmetric and transitive but not reflexive.
   4) R is an equivalence relation.

2. If A = $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, and A+A^{I}= I, then the value of α is
   1) $\frac{\pi}{6}$ 2) $\frac{\pi}{3}$ 3) π 4) $\frac{3\pi}{2}$

3. $\frac{d}{dx}\left(e^{\log_e \sqrt{1+\tan^2 x}}\right)$ when x $\in$ Q_1
   1) $\sec^2 x.\tan x$ 2) $\sec x.\tan^2 x$ 3) $\sec x.\tan x$ 4) $\tan^2 x$

4. The area of the region bounded by parabola $y^2 = 8x$ and latus rectum is
   1) $\frac{4}{3}$ 2) $\frac{16}{3}$ 3) $\frac{32}{3}$ 4) $\frac{8}{3}$

5. The optimal value of the objective function is attained at the points.
   1) On X-axis 2) on Y-axis
   3) which are at the corner points of the feasible region
   4) which are at the point of intersection of the in equation with Y-axis

6. If A and B are events such that P(A/B) = P(B/A), then
   1) $A \subset B$ but $A \neq B$ 2) A = B 3) $A \cap B = \phi$ 4) P(A)=P(B)

7. Find the principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$

8. Find adj A for A = $\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$

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

10. Find the integral $\int \cos ecx(\cos ecx + \cot x)dx$

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

12. Compute the magnitude of the vector $\bar{a} = \bar{i} + \bar{j} + \bar{k}$.

Section – B

II. Answer all the questions **10 X 2 = 20**

Each question carries two marks

13. Check the injectivity and surjectivity of the function $f : N \to N$ given by $f(x) = x^3$.
14. Find the values of x,y and z from $\begin{bmatrix} x+y & 2 \\ 5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$
15. Find the equation of line joining (1,2) and (3,6) using determinants .
16. Differentiate the function cos (sin x) with respect to x.
17. Show that the function f given by $f(x) = x^3 - 3x^2 + 4x, x \in R$ is increasing on R.
18. Integrate the function $\frac{(\log x)^2}{x}$.
19. Verify that the function $y = Ax$ is a solution of the corresponding differential equation $xy^1 = y \ (x \neq 0)$.
20. Classify the following as scalar and vector quantities.
    1) Force 2) Distance
21. If the point s (2,-1,3) , (4,a,1) and (3,1,b) are collinear, then find the ratio between a and b?
22. A and B are two events such that P(A) $\neq 0$, find P(B/A), if
    1) A is a subset of B 2) $A \cap B = \phi$

Section – C

III Answer any Seven questions **7 X 4 = 28**

Each question carries Four marks

23. Show that the relation R in the set A = $\{x \in z : 0 \leq x \leq 12\}$ given by R = $\{(a,b) : |a-b| \text{ is a multiple of } 4\}$ is an equivalence relation. Find the set of all elements related to 1.
24. Write the following function in the simplest form $\tan^{-1} \frac{\sqrt{1+x^2}-1}{x}, x \neq 0$
25. Express the matrix as the sum of a symmetric and a skew symmetric matrix $\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$
26. Show that $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix} = 4xyz$
27. Find $\frac{dy}{dx}$ of $y = \sin^{-1}\left(\frac{1-x^2}{1+x^2}\right), 0 < x < 1$
28. Integrate the rational function $\frac{3x-1}{(x-1)(x-2)(x-3)}$
29. Sketch the graph of y = $|x+3|$ and evaluate $\int_{-6}^{0} |x+3| dx$.

30. Show that the points $A(2\bar{i}-\bar{j}+\bar{k}), B(\bar{i}-3\bar{j}-5\bar{k}), C(3\bar{i}-4\bar{j}-4\bar{k})$ are the vertices of a right angled triangle.
31. Solve the following linear programming problem graphically: Minimize Z = 200x+500y subject to the constraints $x+2y \geq 10, 3x+4y \leq 24, x \geq 0, y \geq 0$.
32. Given two independent events A and B such that P(A) =0.3, P(B) = 0.6. find
    1) P(A and B) 2) P (A and not B) 3) P(A or B) 4) P (neither A nor B)

Section – D

IV Answer any five questions **5 X 8 = 40**
Each question carries eight marks

33. Solve the system of equations using matrix method
    $2x+3y+3z=5, x-2y+z=-4, 3x-y-2z=3$
34. Sand is pouring from a pipe at the rate of $12cm^3/s$. The falling sand forms a cone on the ground un such a way that the height of the cone is always one-sixth of the radius of the base. How fast us the height of the sand cone increasing when the height is 4 cm?
35. Integrate the function $\frac{x+3}{x^2-2x-5}$
36. Evaluate the definite integral $\int_0^{\pi} \frac{x}{1+\sin x} dx$
37. Find the equation of curve passing through the origin given that the slope of the tangent to the curve at any point (x,y) is equal to the sum of the coordinates of the point.
38. If $\bar{a}=2\bar{i}+3\bar{j}+4\bar{k}, \bar{b}=\bar{i}+\bar{j}-\bar{k}$ and $\bar{c}=\bar{i}-\bar{j}+\bar{k}$ then compute $\bar{a}\times(\bar{b}\times\bar{c})$ and verify that it is perpendicular to $\bar{a}$.
39. Find the shortest distance between the lines $\bar{r}=(\bar{i}+2\bar{j}+\bar{k})+\lambda(\bar{i}-\bar{j}+\bar{k})$ and $\bar{r}=(2\bar{i}-\bar{j}-\bar{k})+\mu(2\bar{i}+\bar{j}+2\bar{k})$.
40. Suppose we have four boxes A,B,C and D containing coloured marbles as given below:

Box	Marble colour		
	Red	White	Black
A	1	6	3
B	6	2	2
C	8	1	1
D	0	6	4

One of the boxes has been selected at random and a single marble is drawn from it. If the marble is red, what is the probability that it was drawn from box A?, box B?, box C?

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