MODEL PRACTICE PAPER-1
CLASS – XII
SUBJECT: MATHEMATICS

Time allowed : - **3**hours Maximum Marks :**100**

**General Instructions:**

(i) **All** questions arecompulsory.
(ii) This question paper contains **29**questions.
(iii)Question**1-4**in**SectionA**areveryshort-answertypequestionscarrying**1**markeach.
(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** markseach.
(v) Question **13-23** in **Section C** are long-answer-**I** type questions carrying **4** markseach.
(vi) Question **24-29** in **Section D** are long-answer-**II** type questions carrying **6** markseach.

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## SECTION A

**(Questions1to4carry1markeach.)**

1. A matrix has 5 elements, write all possible order it can have.
2. If $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$, find $\frac{dy}{dx}$
3. Evaluate: -
$$\int_0^1 \frac{dx}{1+x^2}$$
4. If $\vec{P}\ (1,5,4)\ and\ \vec{Q}\ (4,1,2),\ find\ the\ direction\ ratio\ of\ vector\ P\vec{Q}.$

## SECTION B

(Questions 5 to 12 carry 2 marks each)

5. Show that all the diagonal elements of a skew symmetric matrix are zero.
6. Show that the function f(x) = $4x^3 - 18x^2 + 27x - 7$ is increasing function.
7. The radius r of a right circular cylinder is decreasing at the rate of 3 cm/min. and its height h is increasing at the rate of 2 cm/min. When r = 7 cm and h = 2 cm, find the rate of change of the volume of cylinder. [Use π =22/7]
8. If x = sin 3t, y = cos 2t find $\frac{dy}{dx}$at t = $\frac{\pi}{4}$.
9. Find $\int \frac{dx}{x^2+4x+8}$
10. Find the vector equation of the line passing through the point A(1, 2, –1) and parallel to the line 5x – 25 = 14 – 7y = 35z.
11. A small firm manufactures necklaces and bracelets. The total number of necklaces and bracelets that it can handle per day is at most 24. It takes one hour to make a bracelet and half an hour to make a necklace. The maximum number of hours available per day is 16. If the profit on a necklace is Rs. 100 and that on a bracelet is Rs. 300. Formulate on L.P.P. for finding how many of each should be produced daily to maximize the profit ? It is being given that at least one of each must be produced.
12. If P(A) = 0.4 , P(B) = p, P(A U B) =0.6 and A and B are given to be independent events, find the value of p.

## SECTION C

(Questions 13 to 23 carry 4 marks each)

13. Solve for x : - $\tan^{-1}3x + \tan^{-1}2x = \pi/4$.

14. For what value of k , the following function is continuous at $x = 0$?

$$f(x) = \begin{cases} \dfrac{1 - cos4x}{8x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

OR

Find the relationship between $'a'$ and $'b'$ so that the function $'f'$ defined by:

$f(x) = \begin{cases} ax + 1, & if x \leq 3 \\ bx + 3, & if\ x > 3 \end{cases}$ is continuous at $x = 3$.

15. Evaluate $\int \frac{2x}{(x^2+1)(x^2+3)} dx$
16. Evaluate $\int_0^4 |x - 1| dx$

**OR**

Evaluate: - $\int x \sin^{-1} x\, dx$

17. Solve the differential equation: $\frac{dy}{dx} + \frac{2x}{x^2+1} y = \frac{1}{\left(x^2+1\right)^2}$ ; $y(0) = 0$

**OR**

Solve the following differential equation: $\left(x^3 + y^3\right) dy - x^2 y\, dx = 0$

18. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} + \hat{j}$ and $\vec{c} = 3\hat{i} - 4\hat{j} - 5\hat{k}$, then find a unit vector perpendicular to both of the vectors $(\vec{a} - \vec{b})$ and $(\vec{c} - \vec{b})$.

19. Show that the vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are coplanar if $\vec{a} + \vec{b}$, $\vec{b} + \vec{c}$ and $\vec{c} + \vec{a}$ are coplanar.

20. By using properties of determinants prove that

$$\begin{vmatrix} 1 + a^2 - b^2 & 2ab & -2b \\ 2ab & 1 - a^2 + b^2 & 2a \\ 2b & -2a & 1 - a^2 - b^2 \end{vmatrix} = (1 + a^2 + b^2)^3.$$

21. A manufacturer produces of two types of steel trunks. He has two machines A and B. For completing, the first types of trunk requires 3 hours on machine A and 3 hours on machine B, whereas the second type of trunk requires 3hours on machine A and 2 hours on machine B. Machine A and B can work at most for 18 hours and 15 hours per day respectively. He earns a profit of Rs30 and Rs25 per trunk of the first type and the second type respectively. How many trunks of each type must he make each day to make maximum profit?
22. Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively.If both try to solve the problem independently, find the probability that (a) the problem is solved (b) exactly one of them . Solve the problem.

23. An urn contains 5 red and 5 black balls. A ball is drawn at random; its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour are put in the urn and then a ball is drawn at random. What is the probability that the second ball is red?

**OR**

Two cards are drawn simultaneously for successively (without replacement) from

a wellshuffled pack of 52 cards. Find the mean and variance of the no. of aces.

**SECTION D**

(Questions 24 to 29 carry 6 marks each)

24. Let $A = N \times N$ and * be the binary operation on $A$ defined by $(a, b) * (c, d) = (a + c, b + d)$. Show that * is commutative and associative. Find the identity element for * on A, if any.
25. A school wants to awards itsstudents for the values of Honesty, Regularity and Hard work with a total cash award of Rs. 6000. Three times the award money for Hard work added to that given for Honesty amounts to Rs. 11000. The award money given for Honesty and Hard work together is double the one given for Regularity. Represent the above situation algebraically and find the award money for each value, using matrix method. Apart from these values, suggest one more value which the school must include for awards.
26. Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius $R$ *is* $\frac{4R}{3}$. *Also* show that the maximum volume of cone is $\frac{8}{27}$ of the volume of the sphere.

**OR**

An open box with a square base is to be made out of a given quantity of cardboard of area $C^2$ square units. Show that the maximum volume of the box is $\frac{C^3}{6\sqrt{3}}$ cubic units.

27. Find the area of the region included between the parabolas $y^2=4ax$ and $x^2=4ay$, where a>0

**OR**

Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2}=1$ and

the straight line $\frac{x}{a} + \frac{y}{b}=1$

28. Solve the differential equation: -

$$\frac{dy}{dx} + \frac{1}{x}\tan y = \frac{1}{x^2}\tan y \sin y$$

29. Find the coordinates of the foot of perpendicular and the perpendicular distance of the point P(3,2,1) from the plane 2x – y + z + 1 = 0 . Find also find the image of the point in the plane.

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Email: Thirumurugan.kirithish@gmail.com
K.THIRUMURUGAN|PGT|GHSS|VAZHUTHAVUR|VILLUPURAM DT|TAMILNADU|9787062570