

**Sample Paper – 2014**  
**Class – XII**  
**Subject – Mathematics**

**SECTION – A ( 10 X 1 = 10 MARKS).**

1. Let  $A = \{1,2,3\}$ . The number of relations containing (1,2) and (1,3) which are reflexive and symmetric but not transitive is \_\_\_\_\_
2. Find the value of  $\tan\left(\frac{1}{2}\cos^{-1}\frac{\sqrt{5}}{3}\right)$
3. Solve for x and y if  $\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix} = \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$ .
4. If  $A = \begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ , then  $A + A' = I$ , then find the value of  $\alpha$ .
5. Find the equation of the line joining (3, 1) and (9,3) using determinants.
6. Find the projection of  $2\hat{i} - 3\hat{j} + \hat{k}$  on  $2\hat{i} + \hat{j} - \hat{k}$ .
7. Find a vector of magnitude 7 units which is parallel to the vector  $\hat{i} + \hat{j} - \hat{k}$ .
8. Find k so that the lines  $\frac{x-1}{1} = \frac{y-2}{k} = \frac{z+1}{-1}$  and  $\frac{x+1}{k} = \frac{y+1}{2} = \frac{z-2}{1}$  are perpendicular.
9. Evaluate:  $\int \frac{\sin 2x}{\sin^2 x} dx$
10. Evaluate  $\int \frac{e^{\cos x} dx}{\operatorname{cosec} x}$

**SECTION – B ( 12 X 4 = 48 MARKS).**

11. Let R be the relation on  $N \times N$  defined by  $(a,b)R(c,d) \Leftrightarrow ad=bc$  for all  $(a,b), (c,d) \in N \times N$ . Show that R is an equivalence relation on  $N \times N$ .
12. Prove that  $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$ ,  
(OR)  
Prove that  $\cot^{-1}\left[\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right] = \frac{x}{2}$  where  $0 \leq x \leq \frac{\pi}{4}$
13. Let  $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$  show that  $A^2 - 5A + 7I = 0$ . Hence find  $A^{-1}$ .

14. Find the value of a and b so that  $f(x) = \begin{cases} \frac{x-4}{|x-4|} + a & \text{if } x < 4 \\ a+b & \text{if } x = 4 \\ \frac{x-4}{|x-4|} + 2b & \text{if } x > 4 \end{cases}$

is a continuous function at  $x = 4$ .

15. Find the derivative of  $f(x) = (1+x)(1+x^2)(1+x^4)(1+x^8)$ , and hence find  $f'(1)$

16. Find intervals in which the function given by  $f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - 3x^2 + \frac{36}{5}x + 11$  is (a) strictly increasing (b) strictly decreasing.

(OR)

Show that the curves  $2x = y^2$  and  $2xy = k$  cut at right angles if  $k^2 = 8$ .

17. Evaluate  $\int \frac{3x+5}{x^3-x^2-x+1} dx$  (OR) Evaluate  $\int e^x \left( \frac{1+\sin x}{1+\cos x} \right) dx$

18. Solve  $2ye^y dx + (y - 2xe^y) dy = 0$

19. Solve  $\sin^{-1} \left( \frac{dy}{dx} \right) = (x+y)$

20. If  $axb = cxd$ ; and  $axc = bxd$ , prove that  $(a-d)$  is parallel to  $(b-c)$  provided  $a \neq d$  and  $b \neq c$ . (OR) Find the value of  $\lambda$  if the points A(-1, 4, -3), B(3,  $\lambda$ , -5), C(-3, 8, -5) and D(-3, 2, 1) are coplanar.

21. Find the equation of the plane passing through the intersection of the planes  $x+y+z=1$  and  $2x+3y+4z=5=0$  and perpendicular to the plane  $x-y+z=0$

22. An instructor has a question bank consisting of 300 easy True / False questions, 200 difficult True / False questions, 500 easy multiple choice questions and 400 difficult multiple choice questions. If a question is selected at random from the question bank, what is the probability that it will be an easy question given that it is a multiple choice question? What is the benefit of multiple choice questions?

**SECTION – C ( 7 X 6 = 42 MARKS).**

23. Evaluate  $\int \frac{dx}{x^4+1}$

24. A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lowermost. Its semi-vertical angle is  $\tan^{-1}(0.5)$ . Water is poured into it at a constant rate of 5

cubic metre per hour. Find the rate at which the level of the water is rising at the instant when the depth of water in the tank is 4 m.

25. Sketch the region common to the circle  $x^2+y^2=8$  and the parabola  $x^2=4y$ . Also find the area of the common region using integration.

26. Find the distance of the point  $(-2,3,-4)$  from the line  $\frac{x+2}{3} = \frac{2y+3}{4} = \frac{3z+4}{5}$  measured parallel to the plane  $4x+12y-3z+1 = 0$ .

(OR)

Find the equation of the line passing through the image of a point  $(1,6,3)$  in the line

$\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ , and perpendicular to a plane  $2x+3y-5z=6$ .

27. A dietician wishes to mix two types of food in such a way that the vitamin content of the mixture contain at least 8 unit of vitamin A and 10 unit of vitamin C. Food I contains 2unit/kg of vitamin A and 1unit/kg of vitamin C, while food II contains 1 unit/kg of vitamin A and 2unit/kg of vitamin C. It cost Rs.5.00 per kg to purchase food I and Rs.7.00 per kg to produce food II. Determine the minimum cost of the mixture. Formulate the LPP and solve it. Why a person should take balanced food?

28. An amount of Rs 600 crores is spent by the government in three schemes. Scheme A is for saving girl child from the cruel parents who don't want girl child and get the abortion before her birth. Scheme B is for saving of newlywed girls from death due to dowry. Scheme C is planning for good health for senior citizen. Now twice the amount spent on Scheme C together with amount spent on Scheme A is Rs 700 crores. And three times the amount spent on Scheme A together with amount spent on Scheme B and Scheme C is Rs 1200 crores. Find the amount spent on each Scheme using matrices? What is the importance of saving girl child from the cruel parents who don't want girl child and get the abortion before her birth?

29. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1, 2, 3 or 4 with the die?

(OR)

A chairman is biased so that he selects his relatives for a job 3 times as likely as others. If there are 3 posts for a job. Find the probability distribution and expectation for selection of persons other than their relatives.

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VELAMMAL KNOWLEDGE PARK,

PANCHETTI, TAMILNADU.

(Model paper 1 and 2 download from guess papers)