MOGA DEVI MINDA MEMORIAL SCHOOL BAGLA HISAR

FIRST PRE BOARD EXAM (2019-20)

Time: 3Hrs **MATHEMATICS-XII** **M.M: 80**

Note: All questions are compulsory.

General Instructions:

i. All the questions are compulsory.

ii. The question paper consists of 36 questions divided into 4 sections A, B, C, and D.

iii. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4marks each. Section D comprises of 4 questions of 6 marks each.

iv. There is no overall choice. However, an internal choice has been provided in three questions of 1 mark each, two questions of 2 marks each, two questions of 4 marks each, and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.

v. Use of calculators is not permitted.

Section - A

❖ **1 to 10 are multiple choice type questions. Select the correct options:**

1. If A and B are invertible matrices then which of the following is not correct:-

   (A) adj A = |A| A^{-1} (B) det(A^{-1}) = [det(A)]$^{-1}$ (c) $(AB)^{-1} = B^{-1} A^{-1}$ (D) $(A+B)^{-1} = B^{-1} + A^{-1}$

2. If A and B are two matrices of order 3 X m and 3 X n, respectively and m = n, then the order of matrix (5A – 2B) is

   (a) m x 3 (b) 3 x 3 (c) m x n (d) 3 x n

3. The position vectors of the point which divides the join of points $2\vec{a} - 3\vec{b}$ and $\vec{a} + \vec{b}$ in the ratio 3 : 1 is

   (a) $\frac{3\vec{a} + \vec{b}}{2}$ (b) $\frac{7\vec{a} - 8\vec{b}}{4}$ (c) $\frac{3\vec{a}}{4}$ (d) $\frac{5\vec{a}}{4}$

4. Two events E and F are independent if $P(E) = 0.3, P(E \cup F) = 0.5$ $then\ P(\ /F) - P(F / E) equals$

   (A) $\frac{2}{7}$ (B) $\frac{3}{35}$ (C) $\frac{1}{70}$ (D) $\frac{1}{7}$

5. Find the value of λ such that the vectors $\vec{a} = 2\hat{\imath} + \lambda\hat{7} + \hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ are orthogonal

   (a) 0 (B) 1 (c) ${}^{3}/_{2}$ (d) ${}^{-5}/_{2}$

6. If cos ($Sin^{-1} \frac{2}{5}$ + $cos^{-1} x$) = 0, then x is equal to

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(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) 0 (d) 1

7. The probability distribution of a discrete random variable x is given below:-

X	2	3	4	5
P(x)	$\frac{5}{k}$	$\frac{7}{k}$	$\frac{9}{k}$	$\frac{11}{k}$

The value of k is

(a) 8 (b) 16 (d) 32 (d) 48

8. $\int \frac{\cos 2x - \cos 2\theta}{\cos x - \cos\theta}$ dx equal to

(a) 2(sin x + x cosθ) + c (b) 2(sin x – x cosθ) + c

(c) 2(sin x + 2x cosθ) + c (d) 2(sin x – 2x cosθ) + c

9. The degree of the differential equation

$$(\frac{d^2y}{dx^2})^2 + \left(\frac{dy}{dx}\right)^2 = x sin\left(\frac{dy}{dx}\right) is$$

(a) 1 (b) 2 (c) 3 (d) not defined

10. Integrating factor of x $\frac{dy}{dx} - y = x^4 - 3x$ is :

(a) x (b) log x (c) $\frac{1}{x}$ (d) – x

❖ **Q. 11 to Q 15 Fill in the blanks:-**

11. If f be the greatest integer function defined as f(x) = [x] and g be the modulus functions defined as g(x) = |x| , then the value of (gof) $(-\frac{5}{4})$ is ………………

12. If f(x) = $\begin{cases} ax+1 & if\ x \geq 1 \\ x+2 & if\ \ x<1 \end{cases}$ is continuous, then a should be equal to ………………..

13. If x $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ + y $\begin{bmatrix} 3 \\ 5 \end{bmatrix}$ + $\begin{bmatrix} -8 \\ -11 \end{bmatrix}$ = 0 then x – y is …………………………..

14. The curves y = 4x^2 + 2x – 8 and y = x^3 – x + 13 touch each other at the point ………………..

OR

The maximum value of sin x + cos x is …………………

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15. The projection of vector $\vec{a} = 2\hat{\imath} - \hat{7} + \hat{k}$ on $\vec{b} = \hat{\imath} + 2\hat{\jmath} + 2\,\hat{k}$ is ……………………

❖ **[Q – 16 to Q 20] Ans the following questions:-**

16. If A and B are matrices of orders 3 and | A| = 3 and |B| = 5, then find |3AB|

17. $\int_0^{\pi/2} Cos\ x\ e^{\sin x}\ dx$

18. $\int e^x\ (\cos x - \sin x)\ dx$

OR

$\int\ (\cos^2 2\,x - \sin^2 2\,x)\ dx$

19. $\int \frac{Sin\ x + \cos x}{\sqrt{1+\sin 2x}}$ dx

20. Find the general solution of $\frac{dx}{dy} = e^{x-y} + x^2 e^{-y}$

(Section – B)

21. Find the value of

$tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + cot^{-1}\left(\frac{1}{\sqrt{3}}\right) + tan^{-1}(\,Sin\left(-\frac{\pi}{2}\right)]$

OR

Let R be the relation in the set Z of integers given by R= {(a, b): 2divides a – b}. Show that the relation R transitive? Write the equivalence class {0}.

22. If x sin (a+ y) + sin a cos (a + y) = 0 prove that $\frac{dy}{dx} = \frac{sin^2\ (\,a+y)}{\sin a}$

23. A stone is dropped into a quiet lake and waves move in circles at a speed of 4 cm / second. At the instant when the radius of circular wave is 10 cm, how fast is the enclosed area increasing ?

24. 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.

OR

Prove that [$\vec{a} + \vec{b}\,,\ \vec{b} + \vec{c}\,, \vec{c} + \vec{a} = 2\,[\,\vec{a}\,\vec{b}\,\vec{c}$]

25. If Mother, father and son line up at random for a family picture then find $E/_F$ if E = son on one end, F : father in middle.

26. If A = $\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$and I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then find k so that A^2 = 8A + K I

Section - C

27. Let f N ⟶ R be defined by f(x) = $4x^2$ + 12x +15 show that f: N⟶ S where S is the name of the function, is invertible. Also find the inverse of F.

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28. If x = sin t and y = Sin pt prove that $(1 - x^2) \frac{d^2y}{dx^2} - x\frac{dy}{dx} + p^2 y = 0$

OR

If y = tan x + sec x prove that $\frac{d^2y}{dx^2} = \frac{\cos x}{(1 - \sin x)^2}$

29. Solve the differential equation $(tan^{-1}y - x)\, dy = (1 + y^2)dx$

30. $\int_{-1}^{3/2} | x \sin(\pi x)| \, dx$

31. Find the probability distribution of number of doublets in three throws of pair of dice.

OR

Bag 1 contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is turned to be red in colour. Find the probability that the transferred ball is black.

32. A company manufactures two types of novelty souvenirs made of plywood. Souvenirs of type A require 5 minutes each for cutting and 10 minutes each for assembling. Souvenirs of type B require 8 minutes each for cutting and 8 minutes each for assembling. There are 3 hours 20 minutes available for cutting and 4 hours for assembling. The profit of Rs. 5 each for type A and Rs. 6 each for type B souvenirs. How many souvenirs of each type should the company manufacture in order to maximize the profit? Solve by using LPP.

Section - D

33. By using properties of determinants show that $\begin{vmatrix} (b+c)^2 & ba & ca \\ ba & (a+c)^2 & bc \\ ac & bc & (b+a)^2 \end{vmatrix} = 2abc\,(a + b + c)^3$

OR

Given A = $\begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$, B = $\begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$

Find BA and use this to solve the system of equations

y + 2 z = 7 , x – y = 3, 2x + 3y + 4 z= 17

34. Using the method of integration find the area lying above x – axes and included between the circle $x^2 + y^2 = 8x$ and inside the Parabola $y^2 = 4x$

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35. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$ Also find the maximum volume.

OR

Show that the semi vertical angle of the cone of the maximum volume and given slant height is $tan^{-1}\sqrt{2}$.

36. (a) Using Rolle's theorem find the point on the curve y = x(x – 4), xE[0,4] where the tangent is parallel to x- axis .

(b) If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew - Symmetric matrix, find the value of a, b, and c

(c) Find a vector $\vec{r}$ of magnitude $3\sqrt{2}$ units which makes an angles of ${}^{\pi}/_{4}$ and $\frac{\pi}{2}$ with Y and Z – axes, respectively.

NOTE : THREE – D NOT INCLUDED IN QUESTION PAPERS

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