VIDYA MANDIR PUBLIC SCHOOL, SECTOR 15/A, FARIDABAD

CLASS XII [2021-22] **PRE BOARD EXAMINATION** **ROLL NO…….**

TIME: 90 MIN. **SUBJECT – MATHEMATICS** **SET 041/A** **M.M.40**

General Instructions: i) The question paper contains three sections – A, B and C. Each part is compulsory.
ii) Section - A has 20 MCQ's, attempt any 16 out of 20.
iii) Section - B has 20 MCQ's, attempt any 16 out of 20.
iv) Section - C has 10 MCQ's, attempt any 8 out of 10.
v) There is no negative marking.
vi) All questions carry equal marks.

SECTION A

(In this section, attempt any 16 questions out of Questions 1-20)

1. **The value of** $\tan\left[\frac{1}{2}\cos^{-1}\left(-\frac{1}{2}\right)\right]$ **is**

   a. 1 b. $\sqrt{3}$ c. 0 d. none of these

2. **If** $f(x)=\begin{cases}3x-8 & \text{if } x<5\\ 2k & \text{if } x=5\\ x+2 & \text{if } x>5\end{cases}$ **is continuous at x=5, then the value of k is :**

   a. 7 b. 10 c. -5 d. 7/2

3. **If** $A=\begin{bmatrix}0 & 0\\ 2 & 2\end{bmatrix}$ **then** A^{20} **is**

   a. $\begin{bmatrix}0 & 0\\ 2^{20} & 2^{20}\end{bmatrix}$ b. $\begin{bmatrix}0 & 0\\ 2 & 2\end{bmatrix}$ c. $\begin{bmatrix}0 & 0\\ 40 & 40\end{bmatrix}$ d. $\begin{bmatrix}40 & 0\\ 0 & 40\end{bmatrix}$

4. **If** $A=\begin{bmatrix}1 & 2 & 3\end{bmatrix}$ **and** $B=\begin{bmatrix}-5 & 4 & 0\\ 0 & 2 & -1\\ 1 & -3 & 2\end{bmatrix}$ **then AB =**

   a. $\begin{bmatrix}-5 & 4 & 0\\ 0 & 4 & -2\\ 3 & -9 & 6\end{bmatrix}$ b. $\begin{bmatrix}3\\ 1\\ 1\end{bmatrix}$ c. $\begin{bmatrix}-2 & -1 & 4\end{bmatrix}$ d. $\begin{bmatrix}-5 & 8 & 0\\ 0 & 4 & -3\\ 1 & -6 & 6\end{bmatrix}$

5. **The interval on which the function** $f(x)=2x^3+9x^2+12x-1$ **is decreasing is**

   a. $[-1,\infty)$ b. $(-2,-1)$ c. $(-\infty,-2]$ d. $[-1,1]$

6. **For any 2x2 matrix, if** $A(adjA)=\begin{bmatrix}10 & 0\\ 0 & 10\end{bmatrix}$ **, then** $|A|$ **is equal to**

   a. 20 b. 100 c. 10 d. 0

7. **If A = {a, b, c, d, e} and B = { 1, 2, 3, 4} then the number of relations that can be defined from A to B is**

   a. 20 b. 2^{20} c. 2^9 d. 9

8. If $A=\begin{bmatrix}-1 & 4\\ 1 & 3\end{bmatrix}$ and B'=$\begin{bmatrix}0 & 3\\ 1 & 2\end{bmatrix}$ then 7A + 5B =

a. $\begin{bmatrix}-7 & 22\\ 33 & 21\end{bmatrix}$ b. $\begin{bmatrix}7 & -22\\ 33 & 31\end{bmatrix}$ c. $\begin{bmatrix}-7 & 33\\ 22 & 31\end{bmatrix}$ d. $\begin{bmatrix}22 & 21\\ -7 & 31\end{bmatrix}$

9. The point on the curve $y^2 = x$ where the tangent makes an angle 45^0 with the x-axis.

a. $\left(\frac{1}{2},\frac{1}{4}\right)$ b. $\left(\frac{1}{4},\frac{1}{2}\right)$ c. $(4,2)$ d. $(1,1)$

10. The value of $\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)\right]+\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{4}{5}\right)\right]$ is

a. $\frac{5}{6}$ b. $-\frac{5}{6}$ c. $\frac{1}{2}$ d. 0

11. Let T be the set of all triangles and let a relation R on T is defined as aRb, if a is congruent to b, $\forall a,b\in T$. Then

a. R is reflexive but not transitive. b. R is transitive but not symmetric.

c. R is an equivalence relation. d. none of these

12. If $y=\log\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}=$

a. $\frac{4x^3}{1-x^4}$ b. $\frac{-4x}{1-x^4}$ c. $\frac{1}{4-x^4}$ d. $\frac{-4x^3}{1-x^4}$

13. If A & B are square matrices of same order then

a. A + B = B + A b. A + B = B - A c. A – B = B - A d. AB = BA

14. If $x=t^2$, $y=t^3$ then $\frac{d^2y}{dx^2}$ is

a. $\frac{3}{2}$ b. $\frac{3}{4t}$ c. $\frac{4}{3t}$ d. $\frac{3}{2t}$

15. If $A=\begin{bmatrix}5 & x\\ y & 0\end{bmatrix}$ and $A=A'$, then

a. x = 0, y = 5 b. x =y c. x + y = 5 d. None of these

16. At (0,0) the curve $y=x^{\frac{1}{5}}$ has

a. tangent parallel to Y-axis b. tangent parallel to X-axis

c. an oblique tangent d. No tangent

17. Write the element a_{12} of the matrix A = $\left[a_{ij}\right]_{2x2}$ whose elements a_{ij} are given by $a_{ij}=e^{2ix}\sin jx$

$e^{12x}\sin 12x$ b. $e^{2x}\sin 2x$ c. $e^{2x}\sin 4x$ d.None of these

18. Derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t $\tan^{-1}x \quad (-1<x<1)$ is

a. -2 b. 2 c. 0 d. 1

19. In an L.P.P, if the objective function Z = ax + by has the same maximum value on two corner points of the feasible region, then the number of points of which Z_{max} is

a. 0 b. 2 c. finite d. infinite

20. The maximum value of $\left[x(x-1)+1\right]^{\frac{1}{3}}$, $0 \le x \le 1$ is a

a. $\left(\frac{1}{3}\right)^{\frac{1}{3}}$ b. $\frac{1}{2}$ c. 1 d. 0

SECTION B

(In this section, attempt any 16 questions out of Questions 21-40)

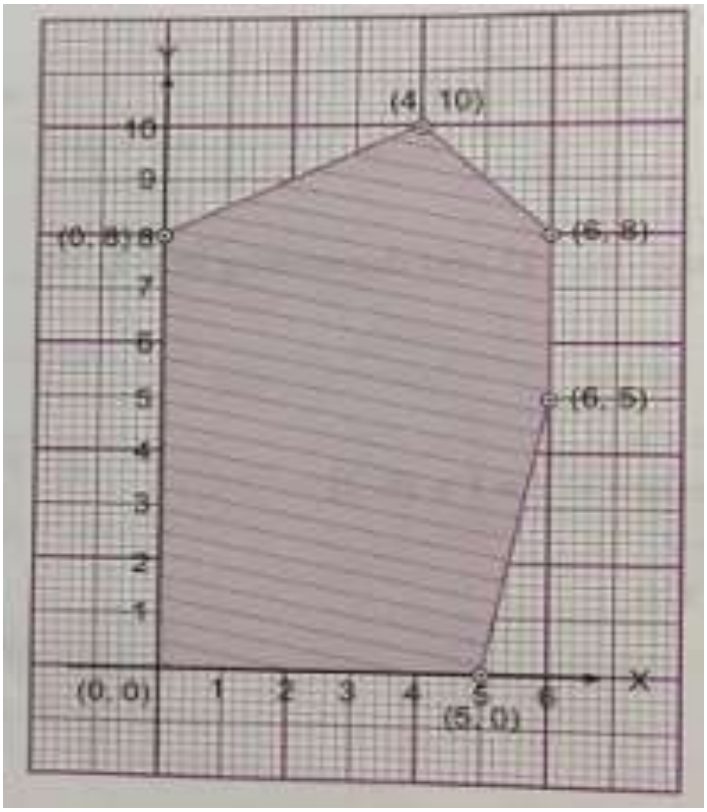
21. f : R –> R is a function defined by $f(x)=\frac{1}{x} \forall x \in R$ then f is

a. one one b. onto c. bijective d. not defined

22. If $x = at^2$, $y = 2at$ then $\frac{d^2y}{dx^2}$ is

a. $-\frac{1}{2at^3}$ b. $\frac{1}{2at^2}$ c. $-\frac{1}{2at^2}$ d. 0

23. The feasible region for an L.P.P. is shown below.. Let Z = 3x – 4y be the objective function. Minimum of Z occurs at



a. (0, 0) b. (0, 8) c. (5, 0) d. (4, 10)

24. If $u=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $v=\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ then $\frac{du}{dv}$ is

a. $\frac{1}{2}$ b. x c. $\frac{1-x^2}{1+x^2}$ d. 1

25. The inverse of matrix $\begin{bmatrix}3 & -2\\ -7 & 5\end{bmatrix}$ is

a. $\begin{bmatrix}5 & 2\\ 7 & 3\end{bmatrix}$ b. $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ c. $\begin{bmatrix}2 & 7\\ 5 & 8\end{bmatrix}$ d. $\begin{bmatrix}1 & 3\\ 0 & 10\end{bmatrix}$

26. The point at which the normal to the curve $y=2x^2-2x+7$ has a slope $\frac{1}{6}$ is

a. (-1, -11) b. (1, -11) c. (-1, 11) d. (-1, -9)

27. The principal value branch of $\operatorname{cosec}^{-1}x$ is

a. $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$ b. $(0,\pi)-\left\{\frac{\pi}{2}\right\}$ c. $\left\{\frac{-\pi}{2},\frac{\pi}{2}\right\}$ d. $\left[\frac{-\pi}{2},\frac{\pi}{2}\right]-\{0\}$

28. If $f(x)=x^2+4x-5$ and $A=\begin{bmatrix}1 & 2\\ 4 & -3\end{bmatrix}$, then f(A) is equal to

a. $\begin{bmatrix}0 & -4\\ 8 & 8\end{bmatrix}$ b. $\begin{bmatrix}2 & 1\\ 2 & 0\end{bmatrix}$ c. $\begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}$ d. $\begin{bmatrix}8 & 4\\ 8 & 0\end{bmatrix}$

29.The values of a for which the function $f(x)=\sin x-ax+b$ increases on R are

a. $(-\infty,\infty)$ b. $[-1,1]$ c. $(-\infty,-1)$ d. none of these

30. Let R be the relation defined on the set N of natural numbers by the rule xRy iff x+2y = 8. Then the domain of R is

a.{2, 4, 8} b. {2, 4, 6} c. {2, 4, 6, 8} d. {1, 2, 3, 4}

31. If is $f(x)=\begin{cases} mx+1, & x\le\frac{\pi}{2}\\ \sin x+n, & x>\frac{\pi}{2}\end{cases}$ continuous at $x=\frac{\pi}{2}$ then

a. $m=1,n=2$ b. $m=\frac{n\pi}{2}+1$ c. $n=\frac{m\pi}{2}$ d. $m=n=\frac{\pi}{2}$

32. If P and Q are symmetric matrices of same order then PQ-QP is a

a. Zero matrix b. Identity matrix

c. Skew symmetric matrix d. Symmetric matrix

33. The smallest value of x^3-18x^2+9x in $[0,9]$ is

a. 126 b. 0 c. 135 d. 160

34. Solution of L.P.P Max Z = x+y subject to $x \le 2, y \le 2$, $x, y \ge 0$ is

a.4 **b. 2** **c. 1** **d. none of these**

35. If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$

a. $1 + \alpha^2 + \beta\gamma = 0$ **b. $1 - \alpha^2 + \beta\gamma = 0$**

c. $1 - \alpha^2 - \beta\gamma = 0$ **d. $1 + \alpha^2 - \beta\gamma = 0$**

36. $2\sec^{-1} 2 + \sin^{-1}\left(\frac{1}{2}\right)$ is equal to

a. $\frac{\pi}{6}$ **b. $\frac{5\pi}{6}$** **c. $\frac{7\pi}{6}$** **d. 1**

37. If $f : R \to R$ is a function defined by $f(x) = 4^x + 4^{|x|}$ then f is

a. one one not onto **b. one one and onto**

c. many one and not onto **d. many one and onto**

38. The number of all possible matrices of order 3x3 with each entry 0 or 1 is

a. 27 **b. 18** **c. 81** **d. 512**

39. The line y = x + 1is tangent to the curve $y^2 = 4x$ at the point

a. (1, 2) **b. (2, 1)** **c. (1, -2)** **d. (-1, 2)**

40. If X, Y, Z, W, P are matrices of order 2xn, 3xk, 2xp, nx3 and pxk respectively, then the restriction on n, k and p so that PY + WY will be defined are

a. k = 3, p = n **b. k is arbitrary, p = 2**

c. p is arbitrary, k = 3 **d. k = 2, p = 3**

SECTION C

In this section attempt any 8 questions. Each question is of 1 mark weightage. Questions 46-50 are based on Case- study.

41. The corners points of the feasible region determined by the system of linear constraints are (0,10), (5,5), (15,15),(0,20). Let Z = px + qy, where p,q > 0 . Condition on p and q so that the maximum of Z occurs at both the points (15,15) and (0,20) is

a. p = q **b. p = 2q** **c. q = 2p** **d. q = 3p**

42. The angle of intersection of two curves $x^2y = 2$ and $xy^2 = 4$ is

a. $\tan^{-1}\frac{3}{5}$ **b. $\tan^{-1} 3$** **c. $\tan^{-1}\frac{5}{3}$** **d. None of these**

43. The maximum value of slope of curve $y = -x^3 + 3x^2 + 12x - 5$ is

a. 15 **b. 12** **c. 9** **d. 0**

44. A point out of the following points lie in plane represented by $2x+3y\leq 12$ is

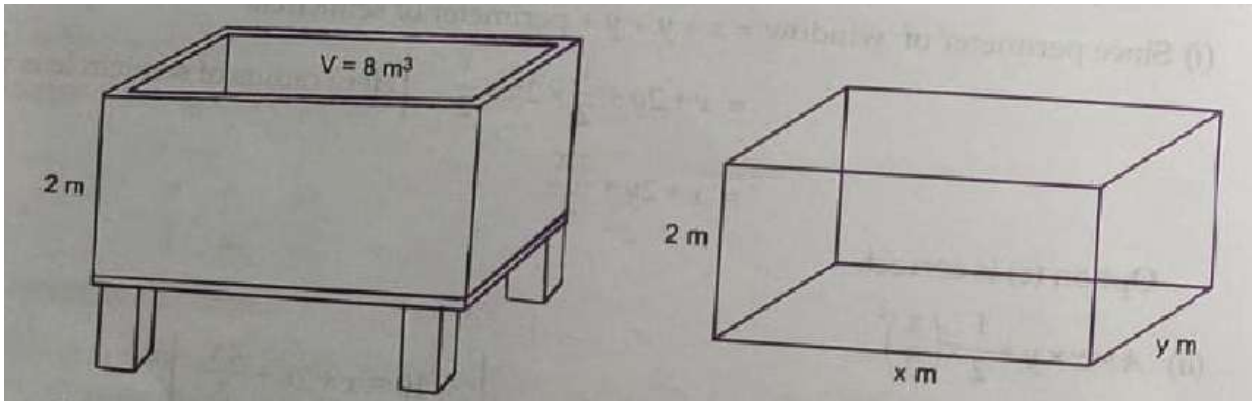
a. (0, 3) **b. (3, 3)** **c. (4, 3)** **d. (0, 5)**

45. If $\theta=\frac{\pi}{6}$, then $\begin{vmatrix} 0 & -1 & 1 \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix}$ is equal to

a. 0 **b. $\frac{1}{2}$** **c. $\frac{\sqrt{3}}{2}$** **d. None of these**

CASE STUDY QUESTION

On the request of villagers, a construction agency designs a tank with the help of an architect. Tank consists of rectangular base with rectangular sides, open at the top so that its depth is 2m and volume is $8m^3$ as shown below:



Based on the above information answer the following questions

46. If x and y are the length and breadth of its rectangular base, then the relation between the variables is

a. x + y = 8 **b. x.y = 4** **c. x + y = 4** **d. $\frac{x}{y}=4$**

47. If construction of tank cost Rs. 70 per sq. metre for the base, and Rs. 45 per sq. metre for the sides, then the making cost C expressed as a function of x is

a. $C=80+80\left(x+\frac{4}{x}\right)$ **b. $C=280x+280\left(x+\frac{4}{x}\right)$**

c. $C=280+180\left(x+\frac{4}{x}\right)$ **d. $C=70x+70\left(x+\frac{4}{x}\right)$**

48. The owner of the construction agency is interested in minimizing the cost C of whole tank, for this to happen the value of x should be

a. 4 m **b. 3 m** **c.1 m** **d. 2 m**

49. For minimum cost C the value of y should be

a. 1 m **b. 3 m** **c. 2 m** **d. 4 m**

50. The Pradhan of village wants to know minimum cost. The minimum cost is

a. Rs. 2000 **b. Rs. 4000** **c. Rs. 11000** **d. Rs. 1000**