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MATHEMATICS — Paper IITime Allowed : $2\frac{1}{2}$ Hours]

[Maximum Marks : 100

PART - I**SECTION - A**

Note :

(i) Answer all the questions.

(ii) Choose the correct answer from the given alternatives : $20 \times 1 = 20$ 1. If A and B are two matrices which satisfy $A + B = B$, then A is

1) row matrix

2) column matrix

3) null matrix

4) diagonal matrix.

2. If $A = \begin{bmatrix} 1 & -1 & 3 \\ 2 & 0 & 6 \end{bmatrix}$ then the element a_{12} is

1) 3

2) 2

3) -1

4) 0.

3. If $(-1 \ -2 \ 4) \begin{pmatrix} 2 \\ a \\ -3 \end{pmatrix} = (-10)$ then the value of a is

1) 2

2) -4

3) 4

4) -2.

[Turn over

4. Two circles with radii a and b touch each other externally. Let c be the radius of the third circle which touches these two circles as well as a common tangent to the two circles. Then $\frac{1}{\sqrt{c}}$ is

1) $\frac{1}{\sqrt{a}} - \frac{1}{\sqrt{b}}$

2) $\frac{1}{\sqrt{a} + \sqrt{b}}$

3) $\frac{1}{\sqrt{a} - \sqrt{b}}$

4) $\frac{1}{\sqrt{a}} + \frac{1}{\sqrt{b}}$

5. ABT is a secant of a circle which intersects the circle at A and B and PT is a tangent to the circle at P . If $PT = 5$ cm and $BT = 2.5$ cm then AB is

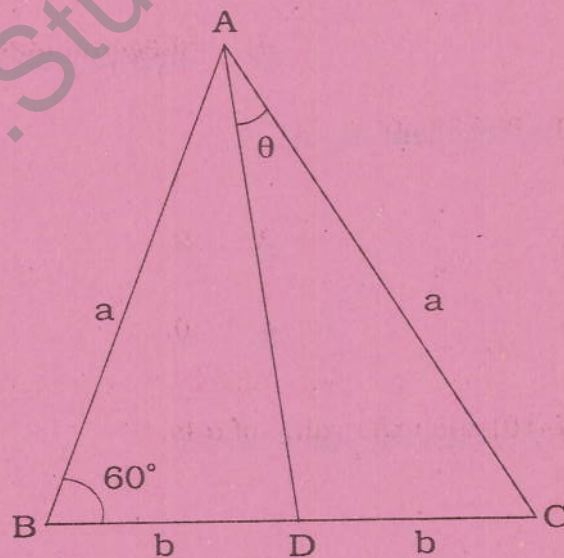
1) 10 cm

2) 7.5 cm

3) 5 cm

4) 25 cm.

6. In the figure θ is



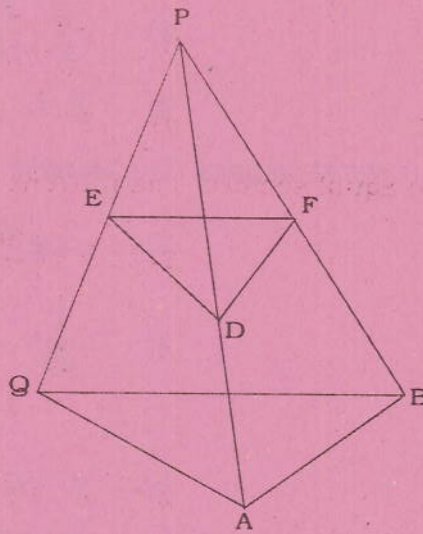
1) 60°

2) 45°

3) 30°

4) 15°

7. In the figure if $DE \parallel AQ$, $DF \parallel AB$, $PE = 2$ cm, $EQ = 5$ cm and $PF = 4$ cm then PB is



- 1) 1.6 cm
2) 10 cm
3) 14 cm
4) 7 cm.
8. If the lengths of the corresponding sides BC and QR of two similar triangles ABC and PQR are respectively 6 cm and 10 cm then the ratio of the areas of ΔABC and ΔPQR is
- 1) 3 : 5
2) 9 : 25
3) 25 : 9
4) 5 : 3.
9. The area of a triangle formed by the points $(0, 4)$, $(4, 0)$ and origin is
- 1) 8 sq. units
2) 16 sq. units
3) 2 sq. units
4) 4 sq. units.
10. If $\theta = 60^\circ$ is the angle made by the line with x -axis in the positive direction, the slope of the line is
- 1) 0
2) $\frac{1}{\sqrt{3}}$
3) $\sqrt{3}$
4) 1.
11. If lines $ax - 5y = 5$ and $2x + y = 1$ are perpendicular then the value of a is
- 1) 2
2) $\frac{5}{2}$
3) $\frac{2}{5}$
4) $\frac{1}{2}$.
12. The lines $y = -3$ and $x = 8$ meet at the point
- 1) $(-8, -3)$
2) $(3, 8)$
3) $(-3, 8)$
4) $(8, -3)$.

13. The x and y intercepts on the line $2x - 3y + 5 = 0$ on the axes are
- 1) $\frac{2}{5}, \frac{3}{2}$ 2) $-\frac{5}{2}, \frac{5}{3}$
3) 2, 5 4) 5, 1.
14. A circle is divided into n equal sectors. The tangent of each angle at the centre is
- 1) $\tan(n)$ 2) $\tan\left(\frac{360^\circ}{n}\right)$
3) $\sqrt{3}$ 4) $\frac{1}{\sqrt{3}}$.
15. $35^\circ - 30^\circ 17' 20''$ is
- 1) $65^\circ 17' 20''$ 2) $4^\circ 42' 40''$
3) $5^\circ 43' 40''$ 4) $6^\circ 42' 40''$.
16. $\sin^2\frac{\pi}{3} + \sin^2\frac{\pi}{6}$ is
- 1) 1 2) 2
3) $\frac{1}{\sqrt{3}}$ 4) $\frac{3}{2}$.
17. $\frac{\sqrt{\operatorname{cosec}^2 15^\circ - 1}}{\operatorname{cosec} 15^\circ}$ is
- 1) $\sin 15^\circ$ 2) $\cos 15^\circ$
3) $2 + \sqrt{3}$ 4) $\frac{-1 - \sqrt{2}}{2}$.
18. When the angle of elevation of the sun is 45° , the length of the shadow of a tower of height 10 m is
- 1) 10 m 2) $10\sqrt{3}$ m
3) $\frac{10}{\sqrt{3}}$ m 4) $\frac{1}{\sqrt{3}}$ m.
19. The range of the first 20 odd natural numbers is
- 1) 38 2) 40
3) 19 4) 39.
20. The probability of a sure event is
- 1) 1 2) 100
3) 0 4) 0.1.

SECTION - B

Note : Answer any ten questions.

10 × 2 = 20

21. Construct a 3×2 matrix whose elements are given by $a_{ij} = \frac{3i-j}{2}$.
22. If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 2 \\ 4 & -1 \end{bmatrix}$, find the matrix C if $2C = A + B$.
23. The sides of a ΔPQR are 8 cm, 10 cm and 12 cm. Three circles are drawn with centres P , Q and R each one touching the other two externally. Determine the radii of the circles.
24. If D and E are respectively the points on the sides AB and AC of a triangle ABC such that $AD = 3$ cm, $DB = 4.5$ cm, $AE = 4$ cm and $EC = 6$ cm, then show that $DE \parallel BC$.
25. ΔABC and ΔDEF are similar. The area of ΔABC is 16 sq. cm and that of ΔDEF is 25 sq. cm. If $EF = 4$ cm, find BC .
26. The area of the triangle whose vertices are $(2, 3)$, $(6, -2)$, $(-2, a)$ is 6 sq. units. Find a .
27. Find p if the slope of a line joining $(-5, 15)$ and $(4, p)$ is $-\frac{1}{9}$.
28. Calculate the slope and y -intercept of the line $2x - 3y + 1 = 0$.
29. Find the equation of the line through the intersection of the lines $3x + 2y = 8$, $5x - 11y + 1 = 0$ and parallel to the line $6x + 13y = 5$.
30. Prove that $(\sec \theta + \tan \theta)(1 - \sin \theta) = \cos \theta$.

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31. Evaluate $\frac{2 \sec \phi}{1 - \tan^2 \phi}$ when $\cos \phi = \frac{\sqrt{3}}{2}$.
32. Solve the triangle ABC in which $\angle A = 25^\circ 30'$, $\angle B = 90^\circ$ and $AB = 10$ cm.
33. A kite is flying at a height of 75 m from the level ground, attached to a string inclined at 60° to the horizontal. Find the length of the string.
34. The variance of 5 values is 36. If each value is doubled then find the standard deviation of the new values.
35. A coin is tossed twice. Find the probability of getting exactly one head.

PART - II**SECTION - C**

Note : Answer any two questions.

$2 \times 5 = 10$

36. Prove that if two triangles are equiangular to one another then the two triangles are similar.
37. In a right triangle PQR , the perpendicular QT on the hypotenuse PR is drawn. Prove that
- i) $PR \times PT = PQ^2$
- ii) $PR \times TR = QR^2$
38. If the bisector of an angle of a triangle bisects the opposite side, prove that the triangle is isosceles.

SECTION - D

Note : Answer any three questions.

3 × 5 = 15

39. Solve : $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$.

40. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, show that $A^2 - 5A - 2I_2 = 0$.

41. A number is selected at random out of first 100 natural numbers. What is the probability that it is either a multiple of 11 or 13 ?

42. Find the S. D. of the following :

x	6	9	12	15	18
f	7	12	13	10	8

SECTION - E

Note : Answer any two questions.

2 × 5 = 10

43. Find x from the following equation :

$$\tan^2 45^\circ - \cos^2 60^\circ = x \cdot \sin 45^\circ \cos 45^\circ \cot 30^\circ$$

44. Prove that $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = 1 - 2 \sec\theta \tan\theta + 2 \tan^2\theta$.

45. From the top and bottom of the tower, the angles of elevation of the top of a cliff with height 400 m are observed to be 30° and 60° . Determine the height of the tower.

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SECTION - F

Note : Answer any three questions.

$3 \times 5 = 15$

46. Show that the points $(4, 8)$, $(-4, 0)$, $(-3, 1)$, $(-7, -3)$ are collinear.
47. $A(4, 1)$, $B(7, 4)$ and $C(5, -2)$ are the vertices of ΔABC . Find the equation of the altitude through A.
48. The lines $2x + 5y - 25 = 0$ and $5x + 4y - 20 = 0$ are diameters of a circle. Find the radius of the circle which passes through the point $(3, 4)$.
49. Obtain the equation of the line which passes through the origin and is concurrent with the lines $x - y - 4 = 0$ and $7x + y + 20 = 0$.

PART - III**SECTION - G**

Note : Answer any one questions.

$1 \times 10 = 10$

50. Draw a circle of diameter 9 cm. Take a point A on it. Using the centre of the circle, draw a tangent to the circle at the point A.
51. Construct a triangle ABC, such that $AB = 7$ cm, $m\angle C = 60^\circ$ and the bisector of $\angle C$ meets AB at a point D where $AD = 2$ cm. Measure the length of the median from C.
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