Register
Number

MATHEMATICS — Paper II

Time Allowed : $2\frac{1}{2}$ Hours]

[Maximum Marks : 100

PART – I

N. B. :   i)   This Part contains *two* Sections, **Section – A** and **Section – B**.

   ii)   **Section – A** contains Multiple Choice Questions. Answer *all* the 20 questions. Each question carries *one* mark.

   iii)   **Section – B** contains 15 questions. Answer any *ten* questions. Each question carries *two* marks.

SECTION – A

Choose the correct answer from the given alternatives : $20 \times 1 = 20$

1. $A = \begin{pmatrix} -5 & 2 & 1 \\ 0 & -3 & 5 \\ 0 & 0 & 1 \end{pmatrix}$ is an example for

   a)   lower triangular matrix   b)   upper triangular matrix

   c)   diagonal matrix   d)   scalar matrix.

2.   Determine the matrix A given by $\left(a_{ij} \right)_{2 \times 2}$ if $a_{ij} = i - j$

   a) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ b) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

   c) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ d) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.
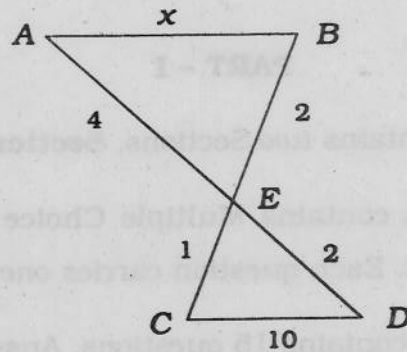
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3.　The identity for matrix addition is

　　a)　unit matrix

　　b)　null matrix

　　c)　negative matrix

　　d)　equal matrix.

4.　Two chords AB and CD of a circle cut internally at E. If $AE = 6$ cm, $BE = 8$ cm and $EC = 4$ cm, then ED is equal to

　　a)　14 cm

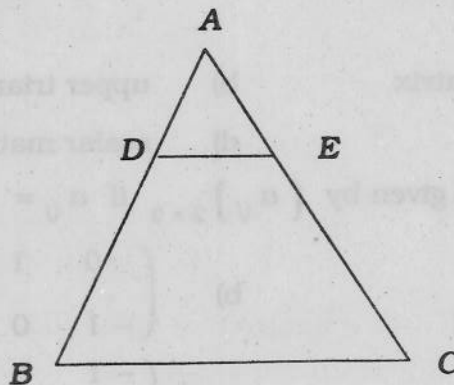　　b)　12 cm

　　c)　10 cm

　　d)　32 cm.

5.　From the figure x is

　　a)　20

　　b)　5

　　c)　4

　　d)　10.

6.　In $\triangle ABC$, AD is the median and also bisects $\angle A$. If $AB = 16$ cm, $BC = 8$ cm, then AC is

　　a)　$\left(\sqrt{4}\right)^2$

　　b)　8

　　c)　4^2

　　d)　2.

7.　In $\triangle ABC$, $DE \parallel BC$, $AB = 7$, $AD = 3$, $AE = 4.5$, then EC is

　　a)　7

　　b)　6

　　c)　4.5

　　d)　8.

8. The distance between the centres of two circles is 10 cm and the radii are 4 cm and 2 cm respectively. The length of their transverse common tangent is

a) 6 cm
b) 8 cm

c) 12 cm
d) 10 cm.

9. The slope of the line joining the points (4, – 2) and (2, – 4) is

a) 1
b) – 1

c) 2
d) – 2.

10. If (5, 7), (3, a), (6, 6) are collinear, then the value of a is

a) 3
b) 6

c) 9
d) 12.

11. The x-intercept of the line $4x - 7y + 28 = 0$ is

a) 7
b) – 7

c) $\frac{1}{7}$
d) $-\frac{1}{7}$.

12. If the straight line $5x + 4y = k$ passes though (2, – 1) then the value of k is

a) 14
b) 3

c) 6
d) 1.

13. The area of triangle formed by the points (0, 4), (4, 0) and origin is

a) 8 sq.units
b) 16 sq.units

c) 2 sq.units
d) 4 sq.units.

14. $\dfrac{\sin^3 \theta + \cos^3 \theta}{\sin \theta + \cos \theta} =$

a) 1
b) $1 - \sin \theta \cos \theta$

c) $\sin \theta + \cos \theta$
d) $\tan \theta$.

15. If the height of the tree and the length of its shadow are equal in measurement, then the sun is seen at an angle of elevation of

a) 30°
b) 45°

c) 60°
d) 90°.

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16. A 24 sided regular polygon is inscribed in a circle of radius 1 m. Then the angle subtended by each side at the centre of the circle is

    a) 24°　　　　　　　　　　　　b) 15°

    c) 360°　　　　　　　　　　　 d) 90°.

17. (tan 7°) (tan 23°) (tan 60°) (tan 67°) (tan 83°) is

    a) 0　　　　　　　　　　　　　b) 7

    c) 1　　　　　　　　　　　　　d) $\sqrt{3}$.

18. $\sin^2 A \cos^2 B - \cos^2 A \sin^2 B$ is

    a) $\sin^2 A$　　　　　　　　　b) $\sin^2 B$

    c) $\sin^2 A - \sin^2 B$　　　　d) $\sin^2 A - \cos^2 B$.

19. If $P(A) = 0.37$, $P(B) = 0.42$, $P(A \cap B) = 0.09$ then $P(A \cup B)$ is

    a) 0.6　　　　　　　　　　　　b) 0.7

    c) 0.8　　　　　　　　　　　　d) 0.9.

20. The variance of 5 values is 16. If each value is doubled, then the new standard deviation is

    a) 4　　　　　　　　　　　　　b) 8

    c) 32　　　　　　　　　　　　 d) 16.

SECTION – B

Answer any *ten* questions :　　　　　　　　　　　　　　　　　$10 \times 2 = 20$

21. Define square matrix with an example.

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

23. State Angle Bisector Theorem.

24. *ABT* is a secant of a circle which intersects at *A* and *B* and *PT* is a tangent to the circle at *P*. If $AT = 9$ cm, $AB = 5$ cm, find *PT*.

25. $\triangle ABC$ and $\triangle DEF$ are similar. The area of $\triangle ABC$ is 9 sq.cm and that of $\triangle DEF$ is 16 sq.cm. If $EF = 4.2$ cm, find *BC*.

26. Prove that the points (4, 5), (6, – 1) and (0, 17) are collinear.

27. The line joining *A* (– 2, 4) and *B* (3, – 5) is parallel to the line joining *C* (0, 4) and *D* (– 3, *y*). Find *y*.

28. Find the equation of the straight line passing through the points (3, 6) and (– 2, 5) .

29. Show that $2x - 5y + 1 = 0$ and $6x - 15y = 4$ are parallel.

30. If $\theta = 30°$, verify that $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$.

31. Prove that $(\csc \theta - \sin \theta)(\sec \theta - \cos \theta)(\tan \theta + \cot \theta) = 1$.

32. A kite is flying at a height of 75 metres from the level ground attached to a string inclined at 60° to the horizontal. Find the length of the string.

33. If $\tan A = \dfrac{\sin 60°}{1 + \cos 60°}$, find *A* where *A* is acute.

34. Three coins are tossed simultaneously. What is the probability of getting at least one head ?

35. The numbers of ice-cream cones bought by men, women, boys, girls and children on a day at the trade fair were 40, 42, 46, 48 and 44 respectively. Find the Standard Deviation.

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PART – II

N. B. : i) This Part contains *four* Sections, **Section – C, Section – D, Section - E** and **Section – F.**

ii) **Section – C** and **Section – E** contain 3 questions. Answer any *two* questions in each Section.

iii) **Section – D** and **Section – F** contain 4 questions. Answer any *three* questions in each Section.

iv) Each question carries *five* marks.

SECTION – C

Answer any *two* questions : $2 \times 5 = 10$

36. State Thales theorem and prove it.

37. *ABCD* is a quadrilateral with *AB = AD. AE* and *AF* are bisectors of ∠ *BAC* and ∠ *DAC* respectively. Prove that *EF* is parallel to *BD*.

38. Prove that if the diagonals of a quadrilateral cut each other in the same ratio, the quadrilateral is a trapezium.

SECTION – D

Answer any *three* questions : $3 \times 5 = 15$

39. If $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & -3 \\ -4 & -4 \end{pmatrix}$, verify that $(AB)^T = B^T A^T$.

40. If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, show that $A^2 - 5A + 7I_2 = 0$.

41. Calculate the S.D. for the following :

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

42. Two dice are thrown together. What is the probability of getting a total of 8 or a product 12 ?

SECTION – E

Answer any *two* questions : $2 \times 5 = 10$

43. Prove that $(1 + \tan \alpha \tan \beta)^2 + (\tan \alpha - \tan \beta)^2 = \sec^2 \alpha \cdot \sec^2 \beta$.

44. Using the formula $\sin (\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$, show that

$$\sin 75° = \frac{\sqrt{3} + 1}{2\sqrt{2}}.$$

45. The angle of elevation of a tower at a point is 45°. After going 20 metres towards the foot of the tower the angle of elevation of the tower becomes 60°. Calculate the height of the tower.

SECTION – F

Answer any *three* questions : $3 \times 5 = 15$

46. Find the equation of the line passing through the point of intersection of the lines $2x + y - 3 = 0$ and $5x + y - 6 = 0$ and perpendicular to the line joining the points $(1, 2)$ and $(2, 1)$.

47. Find the area of the quadrilateral *ABCD* given

   $A (1, 2), B (- 3, 4), C (- 5, - 6)$ and $D (4, - 1)$.

48. Find the value of a so that $3x + y = 2$, $5x + 2y = 3$ and $ax - y = 3$ are concurrent.

49. Find the centroid of the triangle whose equations of the sides are

   $4x - y - 19 = 0$, $x - y - 4 = 0$, $x + 2y + 11 = 0$.

PART – III

N. B. : i)   This Part contains **Section – G**.

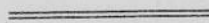   ii)   Answer any *one* question.

        iii) Each question carries *ten* marks.

SECTION – G

Answer any *one* question : $1 \times 10 = 10$

50. Draw a circle of radius 3 cm. At a point *P* on it, draw a tangent to the circle without using the centre.

51. Construct a Δ *XYZ* in which base *XY* = 7 cm, $m \angle Z = 50°$ and the altitude is at a distance of 5 cm from *X*.

SECTION – B

Answer any two questions :   2 × 5 = 10

43.   Prove that $(1 + \tan \alpha \tan \beta)^2 + (\tan \alpha - \tan \beta)^2 = \sec^2 \alpha \cdot \sec^2 \beta$.

44.   Using the formula $\sin (\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$, show that

$$\sin 75° = \frac{\sqrt{3} + 1}{2\sqrt{2}}$$

45.   The angle of elevation of a tower at a point is 45°. After going 20 metres towards the foot of the tower the angle of elevation of the tower becomes 60°. Calculate the height of the tower.

SECTION – C

Answer any three questions :   3 × 5 = 15

46.   Find the equation of the line passing through the point of intersection of the lines $5x + y - 3 = 0$ and $6x + y - 6 = 0$ and perpendicular to the line joining the points $(1, 2)$ and $(2, 1)$.

47.   Find the area of the quadrilateral ABCD given

A $(1, 2)$, B $(- 3, 4)$, C $(- 8, - 3)$ and D $(4, - 1)$.

48.   Find the value of a, so that $5x + y = 3$, $6x + 2y = 5$ and $ax - y = 0$ are concurrent.

49.   Find the centroid of the triangle whose equations of the sides are

$$4x - y - 10 = 0, \quad x - y - 4 = 0, \quad x + 2y + 11 = 0.$$

PART – III

N. B. :   i)   This Part contains Section – D.

          ii)   Answer any one question.

          iii)   Each question carries ten marks.

SECTION – D

Answer any one question :   1 × 10 = 10

50.   Draw a circle of radius 3 cm. At a point P on it, draw a tangent to the circle without using the centre.

51.   Construct a ΔXYZ in which base XY = 7 cm, m ∠ Z = 50° and the altitude is at a distance of 5 cm from K.