Register Number

MATHEMATICS — Paper II

(New Syllabus)

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.   If $\begin{bmatrix} x+y & x-y \\ 7 & 6 \end{bmatrix} = \begin{bmatrix} 10 & 2 \\ 7 & z \end{bmatrix}$, then x, y, z are

   a)   4, 6, 6

   b)   6, 4, 6

   c)   6, 6, 4

   d)   4, 4, 6.

2.   Determine the matrix A given by

   $(a_{ij})_{2 \times 2}$ if $a_{ij} = i - j$

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

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

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

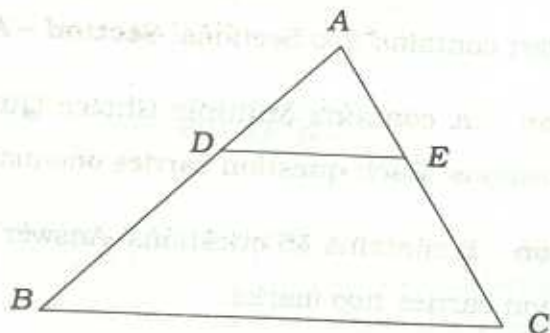   d) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.

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3. $\begin{bmatrix} 4 & 2 \\ 3 & 5 \end{bmatrix}$ is a .... matrix.

   a) diagonal

   b) scalar

   c) square

   d) identity.

4. Two chords AB and CD of a circle intersect externally at P. If $AP = 10$ cm, $CP = 6$ cm and $PD = 5$ cm, then $PB =$

   a) 10 cm

   b) 3 cm

   c) 5 cm

   d) 6 cm.

5. In $\triangle ABC$, DE is parallel to BC, $AD = 4$ cm, $DB = 8$ cm, $AE = 3$ cm, then EC is
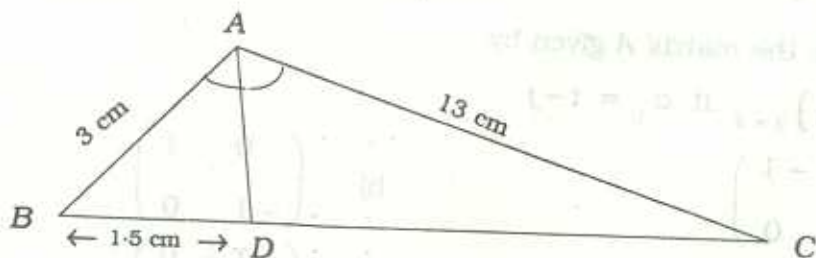

   a) 6 cm

   b) 4 cm

   c) 2 cm

   d) 9 cm.

6. Two circles of radii 8·2 cm and 3·6 cm touch each other externally. The distance between their centres is

   a) 4·6 cm

   b) 11·8 cm

   c) 4·1 cm

   d) 1·8 cm.

7. In the figure, AD is the bisector of $\angle A$; then $DC =$

   a) 6·5 cm

   b) $\frac{13}{3}$ cm

   c) 4·5 cm

   d) 7·5 cm.

8. The ratio of altitudes of two similar triangles is 4 : 5. Then the ratio of their areas is

a) 1 : 2

b) 16 : 25

c) 4 : 5

d) 5 : 4.

9. The slope of the line which is parallel to the line joining the points (0, 0) and (– 5, 5) is

a) 1

b) – 1

c) 2

d) – 2.

10. The value of p, given that the line $\frac{y}{2} = x - p$ passes through the point (– 4, 4), is

a) 4

b) – 6

c) – 2

d) 3.

11. In $\triangle ABC$, $A(-7, -2)$, $B(-6, -2)$ and $C(-2, 1)$ are the vertices. Then the centroid of the triangle is

a) (– 5, – 1)

b) (5, 1)

c) (– 1, – 5)

d) (1, 5).

12. If $x - y = 3$ and $x + 2y = 6$ are the diameters of the circle, then the centre of the circle is

a) (0, 0)

b) (2, 2)

c) (1, – 1)

d) (4, 1).

13. The equation of a straight line which has the y-intercept – 5 and slope 2 is

a) $2x + y + 5 = 0$

b) $2x - y + 5 = 0$

c) $2x - y - 5 = 0$

d) $2x + y - 5 = 0$.

14. $\dfrac{\sqrt{1 - \sin^2 \theta}}{\sin \theta} =$

a) $\cot \theta$

b) $\dfrac{\sin \theta}{2}$

c) $\tan \theta$

d) $\dfrac{1 + \sin \theta}{\sin^2 \theta}$.

15. $\dfrac{\sin \theta}{\operatorname{cosec} \theta} + \dfrac{\cos \theta}{\sec \theta} =$

   a)   0

   b)   2

   c)   1

   d)   cot θ.

16. $x = a \sec \theta, \ y = a \tan \theta,$ then $x^2 - y^2 =$

   a)   1

   b)   − 1

   c) a^2

   d) $- a^2$.

17. The value of $\sin^2 18° + \sin^2 72°$ is

   a)   − 1

   b)   18

   c)   72

   d)   1.

18. If $\left(1 - \cos^2 \theta\right) = \dfrac{3}{4}$ then $\sin \theta =$

   a) $\dfrac{\sqrt{3}}{2}$

   b) $\dfrac{1}{2}$

   c)   1

   d)   0.

19. The standard deviation of 5 values is $5\sqrt{2}$. If each value is increased by 4, then the new standard deviation is

   a) $20\sqrt{4}$

   b) $10\sqrt{2}$

   c) $5\sqrt{2}$

   d) $\dfrac{5\sqrt{2}}{2}$.

20. The probability of selecting a queen of hearts when a card is drawn from a well shuffled pack of 52 cards is

   a) $\dfrac{1}{52}$

   b) $\dfrac{16}{52}$

   c) $\dfrac{1}{13}$

   d) $\dfrac{2}{52}$.

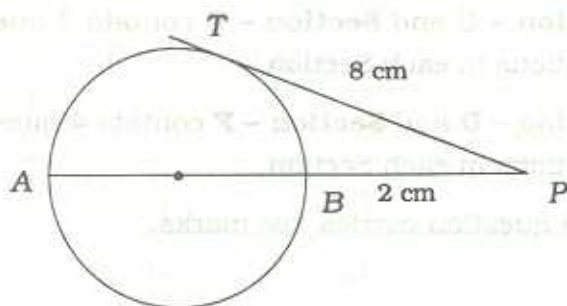Answer any *ten* questions : $10 \times 2 = 20$

21. If $A = \begin{pmatrix} 3 & 7 \\ 2 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} -3 & 2 \\ 4 & -1 \end{pmatrix}$, find the matrix C if $2C = A + B$.

22. Solve : $\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$.

23. In the given figure, AB is a diameter of the circle and PT is a tangent to the circle. If $PB = 2$ cm, $PT = 8$ cm, calculate the radius of the circle.

24. The sides of a $\triangle PQR$ are 8 cm, 10 cm and 12 cm respectively. Three circles are drawn with centres P, Q and R each one touching the other two externally. Determine the radii of the circles.

25. L and M are points on sides AB and AC of a $\triangle ABC$. If $AL = 2$ cm, $LB = 4$ cm and LM is parallel to BC, prove that $3\, LM = BC$.

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

27. The line joining $A(-1, -2)$ and $B(5, 6)$ is perpendicular to the line joining $C(4, 2)$ and $D(0, y)$. Find y.

28. Find the equation of the line cutting off intercepts $\frac{-4}{3}$ and $\frac{3}{4}$ on the X and Y-axes respectively.

29. Write down the equation of a line parallel to $3x - 4y - 5 = 0$ and passing through the point $(2, 3)$.

30. Prove that $\dfrac{\sin^4 \theta - \cos^4 \theta}{\sin^2 \theta - \cos^2 \theta} = 1$.

31. Verify that $\sin 90° = \sin 60° \cos 30° + \cos 60° \sin 30°$.

32. When $0° \le \theta \le 90°$, solve the following :

$2 \cos 3\theta = 1$.

33. Prove that : $(\cos \theta - \sin \theta)^2 + (\cos \theta + \sin \theta)^2 = 2$.

34. Find the standard deviation of the first five natural numbers.

35. Find the probability of getting an even number when a die is thrown.

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.

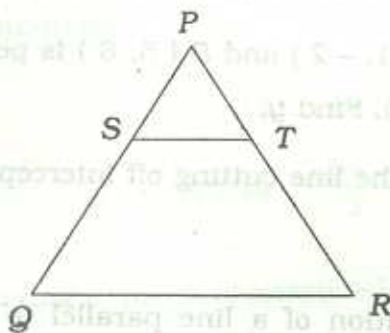iv) Each question carries *five* marks.

SECTION – C

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

36. State and prove basic proportionality theorem.

37. D is the midpoint of side BC of $\triangle ABC$. DP bisects $\angle ADB$ meeting AB at P and DQ bisects $\angle ADC$ meeting AC at Q. Prove that PQ is parallel to BC.

38. In the figure, ST is parallel to QR and $\dfrac{PS}{SQ} = \dfrac{3}{5}$. Calculate the value of

i) $\dfrac{\text{Area of } \triangle PST}{\text{Area of } \triangle PQR}$

ii) $\dfrac{\text{Area of trapezium } STRQ}{\text{Area of } \triangle PQR}$

SECTION – D

Answer any *three* questions : 3 × 5 = 15

39. If $A = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 4 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, show that $A^2 - 7A + 10I_3 = 0$.

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

41. Find the variance of the following data :

Variable	10	6	18	14	22	2
Frequency	10	7	7	15	6	5

42. 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 ?

SECTION – E

Answer any *two* questions : 2 × 5 = 10

43. Prove that $\dfrac{1}{\sec A + \tan A} - \dfrac{1}{\cos A} = \dfrac{1}{\cos A} - \dfrac{1}{\sec A - \tan A}$.

44. Find the area of an isosceles triangle with base 10 cm and vertical angle 47°.

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 × 5 = 15

46. The vertices of a triangle are $A(1, 8)$, $B(-2, 4)$ and $C(8, -5)$. M and N are the midpoints of AB and AC. Show that MN is parallel to BC and $MN = \dfrac{1}{2} BC$.

47. If a line passes through the midpoint of AB where A is $(3, 0)$ and B is $(5, 4)$ and makes an angle 60° with X-axis, find its equation.

48. Find the equation of the straight line joining the point of intersection of $3x - y + 9 = 0$ and $2y + x - 4 = 0$ to the point of intersection of $2x + y = 4$ and $2y = x + 3$.

49. Find the orthocentre of the triangle whose vertices are $(-2, 1)$, $(-1, -4)$ and $(0, -5)$.

PART – III

N. B. : i)   This Section contains 2 questions. Answer any *one* question.

ii)   Each question carries *ten* marks.

SECTION – G

Answer any *one* question :

$1 \times 10 = 10$

50. Draw a circle of radius 3 cm. Take a point at a distance of 5·5 cm from the centre of the circle. From the external point draw two tangents to the circle (using the centre of the circle). Measure the length of the tangents and verify it.

51. Construct a triangle ABC in which $BC = 7·5$ cm, $\angle A = 55°$ and the median through A is of length 5·5 cm. Also find the length of the altitude drawn from the vertex A on BC.