Mathematics – Test Paper

Time Allowed : 2 ½ hours **Max. Marks : 80**

General Instructions :

Attempt all questions from **Section A** and any **four** questions from **Section B.**
All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer. Omission of essential working will result in the loss of marks.
Mathematical tables are provided.

Section A (40 Marks)

Attempt **all** questions from this section

1. (a) Without using trigonometrical tables, prove that $\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ = 1$. [3]

(b) AB and CD are two chords of a circle intersecting at a point P outside the circle when produced, such that PA = 16 cm, PC = 10 cm and PD = 8 cm. Find AB. [4]

(c) Find the mean proportional between $\left(7+\sqrt{3}\right)$ and $\left(7-\sqrt{3}\right)$. [3]

2. (a) Solve $7 \le 4x + 2 \le 12$, $x \in$ R. Graph the solution set on the number line. [4]

(b) The common factor of $2x^2 + 5x + k$ and $2x^2 + 3x + l$ is $(2x - 1)$. Find the values of k and l. [3]

(c) If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, show that $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. [3]

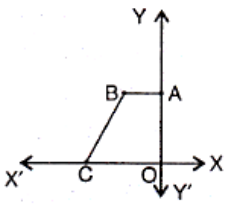
3. (a) Show that the opposite angles of a cyclic quadrilateral are supplementary. [4]

(b) The marks of 20 students in a test were as follows :

10, 15, 14, 11, 10, 8, 10, 6, 18, 19, 16, 14, 10, 3, 4, 20, 3, 10, 16, 10

Find : (i) the mean (ii) the median (iii) the mode. [3]

(c) In the figure, part of a geometrical figure is given. Complete the figure so that the resulting figure is symmetrical about both the x-axis and the y-axis. [3]



4. (a) Mr. Sagar's savings bank account passbook entries are as follows :

Date	Particulars	Withdrawn (Rs)	Deposited (Rs)	Balance (Rs)
April 1, 2003	B/F	—	—	4175
May 5, 2003	To cheque	835	—	3340
May 15, 2003	By clearing	—	1550	4890
July 6, 2003	To cheque	750	—	4140
August 4, 2003	By cash	—	2300	6440
Sept. 6, 2003	To cheque	500	—	5940

Calculate the interest on minimum balance on or after 10th day of the month from April to September at $4\frac{1}{2}\%$ p.a. [4]

(b) Draw a circle of radius 2.5 cm. Draw two tangents to it inclined at an angle of 45° to each other. [3]

(c) Find the volume of a solid in the form of a right circular cylinder with hemispherical ends whose extreme length is 22 cm and diameter 3 cm. [3]

Section B (40 Marks)

Attempt **any four** questions from this section

5. (a) Angle of elevation of a cloud from a point 20 m above the surface of a lake is 30°. Angle of depression of the reflection of the cloud in the lake from the same point is 60°. Calculate the height of the cloud above the lake. [4]

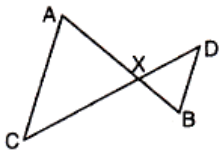
(b) Draw two intersecting lines AB and CD. Find the position of the point which is 2 cm away from AB and 1.8 cm away from CD. [3]

(c) In how many years a sum of Rs 6400 compounded quarterly at the rate of 5% p.a. will amount to Rs 6561? [3]

6. (a) Two unbiased coins are tossed simultaneously. Find the probability of getting :

(i) two heads (ii) one head (iii) at least one head [4]

(b) In the figure, AX = 2BX and CX = 2XD.
Prove that :
(i) ΔAXC and ΔBXD are similar
(ii) AC ∥ DB [3]



(c) A manufacturer sold a dininning table to a dealer for Rs 8000. The dealer sold it to the shopkeeper at a profit of Rs 2000. The shopkeeper sold it to the consumer at a profit of Rs 3000. Find (i) the total VAT received by the government at 8% (ii) the amount paid by the consumer inclusive of sales tax. [3]

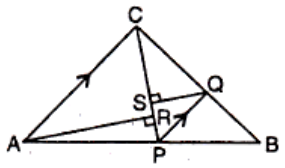
7. (a) Construct a ΔABC in which AB = AC = 3 cm and BC = 2 cm. Using a ruler and compasses only, draw the reflection A′BC of ΔABC in BC. Draw the lines of symmetry of the figure AB′AC. [3]

(b) Using the quadratic formula, solve : $\frac{x-1}{x-2} + \frac{x-2}{x-3} = 4$. [4]

(c) If $A = \begin{bmatrix} 4 & -5 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix}$, find 6A – 3B. [3]

8. (a) Neha invests in 12% Rs 25 shares of a company quoted at Rs 36. Her income from this investment is Rs 720. Calculate :

(i) the total amount of money invested by her in these shares.
(ii) the number of shares bought by her.
(iii) % return on her investment. [4]

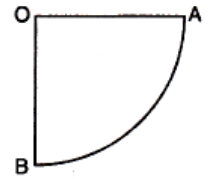


(b) In the figure, P is a point on AB such that
AP : PB = 4 : 3 and PQ ∥ AC. Calculate the ratio of PQ : AC. [3]

(c) In what ratio does the point (–3, 7) divide the join of A(–5, 11) and B (4, – 7)? [3]

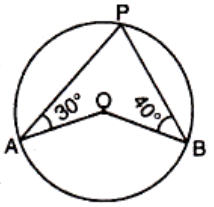
9. (a) The area of the quadrant OAB of a circle is $9\frac{5}{8}$ cm². Calculate :

(i) OA (ii) the perimeter of the quadrant. [4]



(b) Find the equation of a line that passes through (1, 3) and is parallel to the line $y = -2x + 4$. [3]

(c) In the figure, O is the centre of the circle. If ∠PAO = 30° and ∠PBO = 40°, find : (i) ∠APB (ii) ∠AOB. [3]



10. (a) Find the value of m such that the lines $3xm + 3y = 5$ and $y = 1 - 2x$ are perpendicular to each other. [4]

(b) Draw an ogive for the following distribution and hence estimate the median.

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	6	7	9	10	8	7	3

[6]

11. (a) Show that the equation $x^2 + 2px - 3 = 0$ has real and distinct roots for all values of p. [3]

(b) Prove that : $\frac{1}{1-\sin\theta} + \frac{1}{1+\sin\theta} = 2\sec^2\theta$. [3]

(c) From the following frequency distribution, find mean, mode and median.

Variate	10	11	13	15	18	20	24
Frequency	4	3	7	1	5	2	3

[4]