MATHEMATICS

Maximum Marks: 80

Time allowed: Two and half hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

*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 loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ]

***Mathematical tables and graph papers are provided**.*

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i) If $\begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ -8 \end{bmatrix}$, the value of x and y respectively are:

(a) 1, –2

(b) –2, 1

(c) 1, 2

(d) –2, –1

(ii) If $x - 2$ is a factor of $x^3 - kx - 12$, then the value of k is:

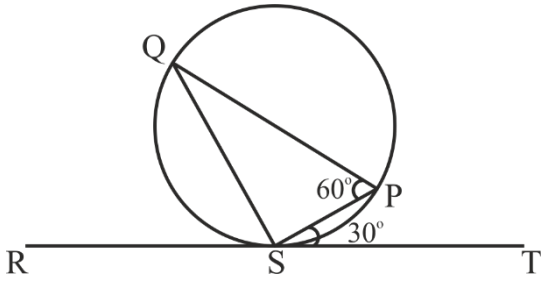
(a) 3

(b) 2

(c) –2

(d) – 3

(iii) In the given diagram RT is a tangent touching the circle at S. If $\angle PST = 30^o$ and $\angle SPQ = 60^o$ then $\angle PSQ$ is equal to:



(a) 40^o

(b) 30^o

(c) 60^o

(d) 90^o

(iv) A letter is chosen at random from all the letters of the English alphabets. The probability that the letter chosen is a vowel, is:

(a) $\frac{4}{26}$

(b) $\frac{5}{26}$

(c) $\frac{21}{26}$

(d) $\frac{5}{24}$

(v) If 3 is a root of the quadratic equation $x^2 - px + 3 = 0$ then p is equal to:

(a) 4

(b) 3

(c) 5

(d) 2

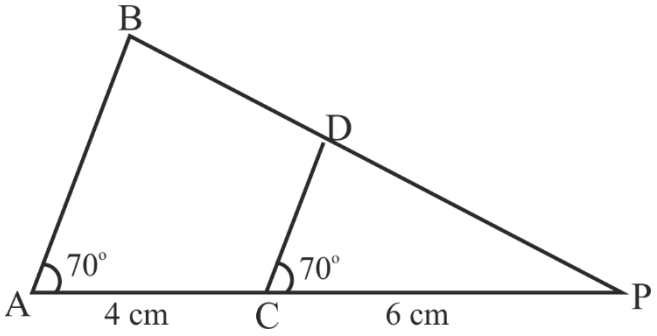
(vi) In the given figure $\angle BAP = \angle DCP = 70^o$, PC = 6 cm and CA = 4 cm, then PD : DB is:

(a) 5 : 3

(b) 3 : 5

(c) 3 : 2

(d) 2 : 3



(vii) The printed price of an article is ` 3080. If the rate of GST is 10% then the GST charged is:

(a) ` 154

(b) ` 308

(c) ` 30.80

(d) ` 15.40

(viii) $(1 + \sin A)(1 - \sin A)$ is equal to:

(a) $\text{cosec}^2 A$

(b) $\sin^2 A$

(c) $\sec^2 A$

(d) $\cos^2 A$

(ix) The coordinates of the vertices of ΔABC are respectively (–4, –2), (6, 2) and (4, 6). The centroid G of ΔABC is:

(a) (2, 2)

(b) (2, 3)

(c) (3, 3)

(d) (0, –1)

(x) The n^{th} term of an Arithmetic Progression (A.P.) is $2n + 5$. The 10^{th} term is:

(a) 7

(b) 15

(c) 25

(d) 45

(xi) The mean proportional between 4 and 9 is:

(a) 4

(b) 6

(c) 9

(d) 36

(xii) Which of the following cannot be determined graphically for a grouped frequency distribution?

(a) Median

(b) Mode

(c) Quartiles

(d) Mean

(xiii) Volume of a cylinder of height 3 cm is 48π. Radius of the cylinder is:

(a) 48 cm

(b) 16 cm

(c) 4 cm

(d) 24 cm

(xiv) Naveen deposits ` 800 every month in a recurring deposit account for 6 months. If he receives ` 4884 at the time of maturity, then the interest he earns is:

(a) ` 84

(b) ` 42

(c) ` 24

(d) ` 284

(xv) The solution set for the inequation $2x + 4 \leq 14$, $x \in W$ is:

(a) {1, 2, 3, 4, 5}

(b) {0, 1, 2, 3, 4, 5}

(c) {1, 2, 3, 4}

(d) {0, 1, 2, 3, 4}

Question 2

(i) Find the value of '*a*' if $x - a$ is a factor of the polynomial $3x^3 + x^2 - ax - 81$. [4]

(ii) Salman deposits ` 1000 every month in a recurring deposit account for 2 years. If he receives ` 26000 on maturity, find: [4]

(a) the total interest Salman earns.

(b) the rate of interest.

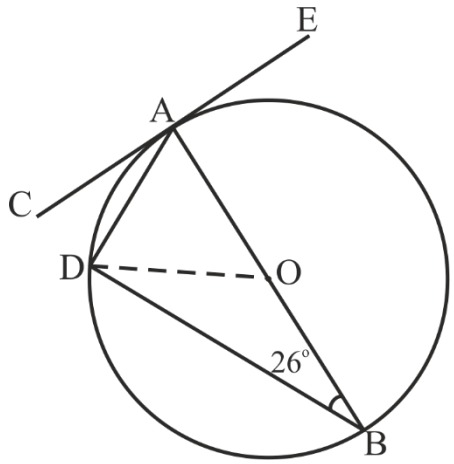
(iii) In the given figure O, is the centre of the circle. CE is a tangent to the circle at A. If $\angle ABD = 26^o$, then find: [4]

(a) $\angle BDA$

(b) $\angle BAD$

(c) $\angle CAD$

(d) $\angle ODB$



Question 3

(i) Solve the following quadratic equation: [4]

$x^2 + 4x - 8 = 0$

Give your answer correct to one decimal place.

(Use mathematical tables if necessary.)

(ii) Prove the following identity: [4]

$(\sin^2\theta - 1)(\tan^2\theta + 1) + 1 = 0$

(iii) Use **graph sheet** to answer this question. Take 2 cm = 1 unit along both the axes. [5]

(a) Plot A, B, C where A(0, 4), B(1, 1) and C(4, 0)

(b) Reflect A and B on the *x*-axis and name them as E and D respectively.

(c) Reflect B through the origin and name it F. Write down the coordinates of F.

(d) Reflect B and C on the *y*-axis and name them as H and G respectively.

(e) Join points A, B, C, D, E, F, G, H and A in order and name the closed figure formed.

SECTION B (40 Marks)

*(Attempt **any four** questions from this Section.)*

Question 4

(i) [3]

$If\ A = \begin{bmatrix}1 & 3\\ 2 & 4\end{bmatrix}, B = \begin{bmatrix}1 & 2\\ 2 & 4\end{bmatrix}, C = \begin{bmatrix}4 & 1\\ 1 & 5\end{bmatrix} and\ I = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}.$

$Find\ A(B + C) - 14I$

(ii) ABC is a triangle whose vertices are A(1, –1), B(0, 4) and C(–6, 4). [3]

D is the midpoint of BC. Find the:

(a) coordinates of D.

(b) equation of the median AD.

(iii) In the given figure, O is the centre of the circle. PQ is a tangent to the circle at T. [4]
Chord AB produced meets the tangent at P.

$AB = 9\text{ cm}, BP = 16\text{ cm}, \angle PTB = 50°$

$\angle OBA = 45°$

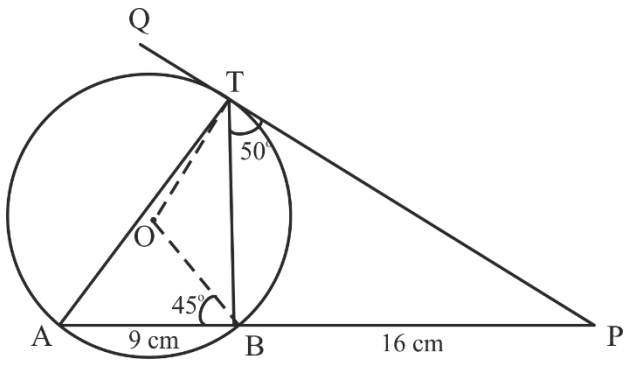
Find:

(a) length of PT

(b) ∠BAT

(c) ∠BOT

(d) ∠ABT



Question 5

(i) Mrs. Arora bought the following articles from a departmental store: [3]

S. No.	Item	Price	Rate of GST	Discount
1.	Hair oil	₹ 1200	18%	₹ 100
2.	Cashew nuts	₹ 600	12%	–

Find the:

(a) Total GST paid.

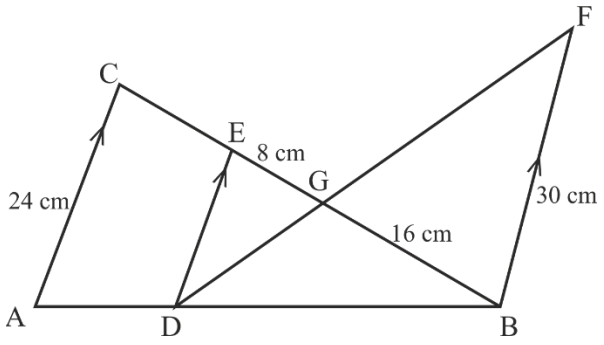
(b) Total bill amount including GST.

(ii) Solve the following inequation. Write down the solution set and represent it on the real number line. [3]

$-5(x-9) \geq 17-9x > x+2, x \epsilon R$

(iii) In the given figure, AC // DE // BF. [4]

If AC = 24 cm, EG=8 cm, GB=16 cm, BF=30 cm.



(a) Prove ΔGED ~ ΔGBF

(b) Find DE

(c) DB : AB

Question 6

(i) The following distribution gives the daily wages of 60 workers of a factory. [3]

Daily income in `	Number of workers (*f*)
200 – 300	6
300 – 400	10
400 – 500	14
500 – 600	16
600 – 700	10
700 – 800	4

Use graph paper to answer this question.

Take 2 cm = ` 100 along one axis and 2 cm = 2 workers along the other axis.

Draw a histogram and hence find the mode of the given distribution.

(ii) The 5^{th} term and the 9^{th} term of an Arithmetic Progression are 4 and –12 respectively. [3]

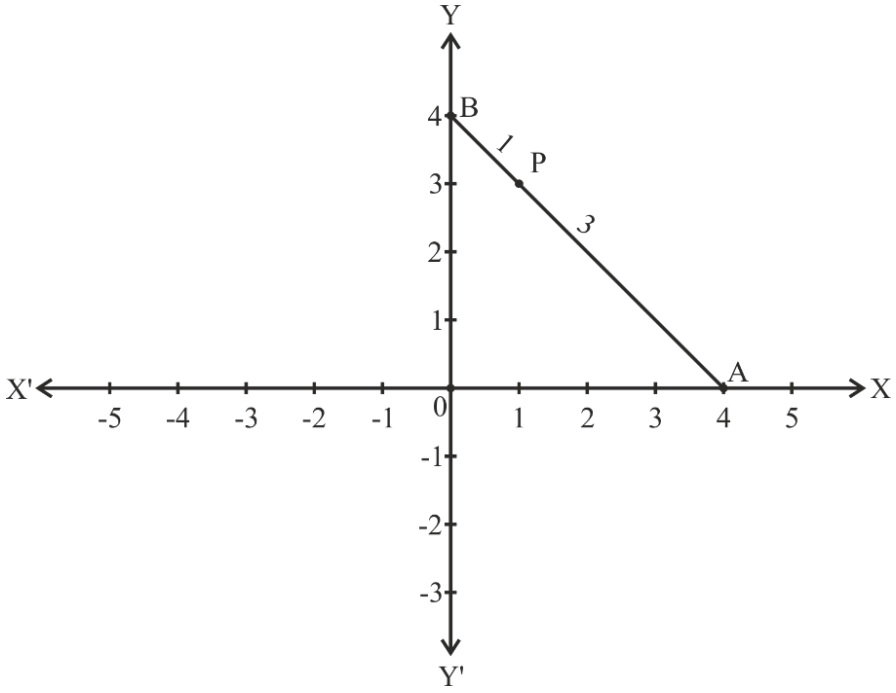
Find:

(a) the first term

(b) common difference

(c) sum of 16 terms of the AP.

(iii) A and B are two points on the *x*-axis and *y*-axis respectively. [4]



(a) Write down the coordinates of A and B.

(b) P is a point on AB such that AP : PB = 3 : 1. Using **section formula** find the coordinates of point P.

(c) Find the equation of a line passing through P and perpendicular to AB.

Question 7

(i) A bag contains 25 cards, numbered through 1 to 25. A card is drawn at random. What is the probability that the number on the card drawn is: [3]

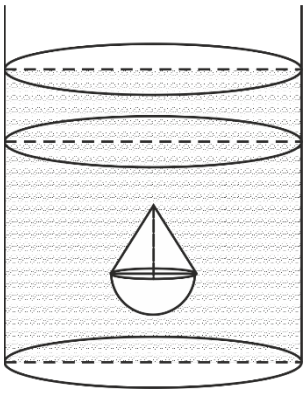
(a) multiple of 5

(b) a perfect square

(c) a prime number?

(ii) A man covers a distance of 100 km, travelling with a uniform speed of x km/hr. Had the speed been 5 km/hr more it would have taken 1 hour less. Find x the original speed. [3]

(iii) A solid is in the shape of a hemisphere of radius 7 cm, surmounted by a cone of height 4 cm. The solid is immersed completely in a cylindrical container filled with water to a certain height. If the radius of the cylinder is 14 cm, find the rise in the water level. [4]



Question 8

(i) The following table gives the marks scored by a set of students in an examination. Calculate the mean of the distribution by using the short cut method. [3]

Marks	Number of Students (f)
0 – 10	3
10 – 20	8
20 – 30	14
30 – 40	9
40 – 50	4
50 – 60	2

(ii) What number must be added to each of the numbers 4, 6, 8, 11 in order to get the four numbers in proportion? [3]

(iii) Using ruler and compass construct a triangle ABC in which AB = 6 cm, $\angle BAC = 120^o$ and AC = 5 cm. Construct a circle passing through A, B and C. Measure and write down the radius of the circle. [4]

Question 9

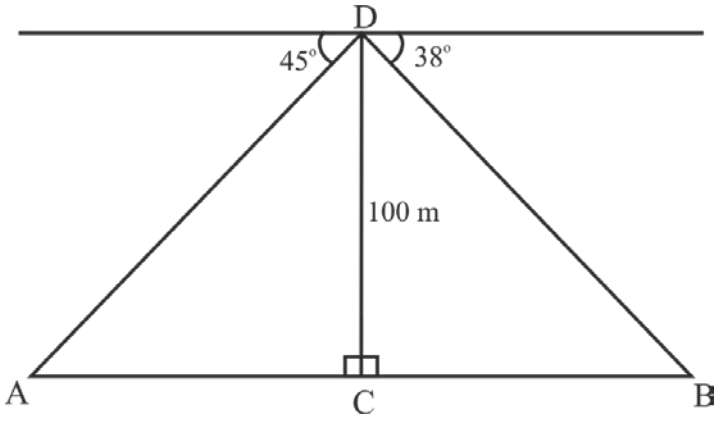
(i) Using Componendo and Dividendo solve for x: [3]

$$\frac{\sqrt{2x+2}+\sqrt{2x-1}}{\sqrt{2x+2}-\sqrt{2x-1}} = 3$$

(ii) Which term of the Arithmetic Progression (A.P.) 15, 30, 45, 60… is 300? [3]
Hence find the sum of all the terms of the Arithmetic Progression (A.P.)

(iii) From the top of a tower 100 m high a man observes the angles of depression of two ships **A** and **B**, on opposite sides of the tower as 45^o and 38^o respectively. If the foot of the tower and the ships are in the same horizontal line find the distance between the two ships **A** and **B** to the nearest metre. [4]

(Use Mathematical Tables for this question.)



Question 10

(i) Factorize completely using factor theorem: [4]

$2x^3 - x^2 - 13x - 6$

(ii) Use **graph paper** to answer this question. [6]

During a medical checkup of 60 students in a school, weights were recorded as follows:

Weight (in kg)	Number of Students
28 – 30	2
30 – 32	4
32 – 34	10
34 – 36	13
36 – 38	15
38 – 40	9
40 – 42	5
42 – 44	2

Taking 2 cm = 2 kg along one axis and 2 cm = 10 students along the other axis draw an ogive. Use your graph to find the:

(a) median

(b) upper Quartile

(c) number of students whose weight is above 37 kg