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## MATHEMATICS

*(Two hours and a half)*

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

*You will not be allowed to write during the 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.*

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*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 are provided.*

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### SECTION A (40 Marks)

*Attempt all questions from this Section.*

#### Question 1

(a) If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , find  $A^2 - 5A + 7I$ . [3]

- (b) The monthly pocket money of Ravi and Sanjeev are in the ratio 5:7. Their expenditures are in the ratio 3:5. If each saves ₹ 80 every month, find their monthly pocket money. [3]

- (c) Using the Remainder Theorem factorise completely the following polynomial.  
 $3x^3 + 2x^2 - 19x + 6$  [4]

#### Question 2

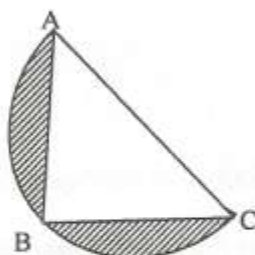
- (a) On what sum of money will the difference between the compound interest and simple interest for 2 years be equal to ₹25 if the rate of interest charged for both is 5% p.a.? [3]

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**This paper consists of 7 printed pages and 1 blank page.**

- (b) ABC is an isosceles right angled triangle with  $\angle ABC = 90^\circ$ . A semi-circle is drawn with AC as the diameter. If  $AB = BC = 7$  cm, find the area of the shaded region. (Take  $\pi = \frac{22}{7}$ )

[3]

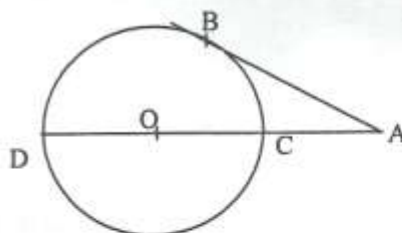


- (c) Given a line segment AB joining the points A(-4, 6) and B(8, -3). Find:
- the ratio in which AB is divided by the y-axis.
  - find the coordinates of the point of intersection.
  - the length of AB.

[4]

### Question 3

- (a) In the given figure O is the centre of the circle and AB is a tangent at B. If  $AB = 15$  cm and  $AC = 7.5$  cm. Calculate the radius of the circle.



[3]

- (b) Evaluate without using trigonometric tables:

$$\cos^2 26^\circ + \cos 64^\circ \sin 26^\circ + \frac{\tan 36^\circ}{\cot 54^\circ}$$

[3]

- (c) Marks obtained by 40 students in a short assessment is given below, where  $a$  and  $b$  are two missing data.

Marks	5	6	7	8	9
Number of Students	6	$a$	16	13	$b$

If the mean of the distribution is 7.2, find  $a$  and  $b$ .

[4]

#### Question 4

- (a) Kiran deposited ₹200 per month for 36 months in a bank's recurring deposit account. If the bank pays interest at the rate of 11% per annum, find the amount she gets on maturity. [3]
- (b) Two coins are tossed once. Find the probability of getting:  
(i) 2 heads (ii) at least 1 tail. [3]
- (c) Using graph paper and taking 1 cm = 1 unit along both x-axis and y-axis.  
(i) Plot the points A(-4, 4) and B(2, 2).  
(ii) Reflect A and B in the origin to get the images A' and B' respectively.  
(iii) Write down the co-ordinates of A' and B'.  
(iv) Give the geometrical name for the figure ABA'B'.  
(v) Draw and name its lines of symmetry. [4]

#### SECTION B (40 Marks)

Attempt any *four* questions from this Section

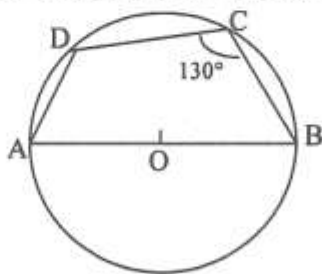
#### Question 5

(a)

In the given figure, AB is the diameter of a circle with centre O.

$\angle BCD = 130^\circ$ . Find:

- (i)  $\angle DAB$   
(ii)  $\angle DBA$



[3]

- (b) Given  $\begin{bmatrix} 2 & 1 \\ -3 & 4 \end{bmatrix} X = \begin{bmatrix} 7 \\ 6 \end{bmatrix}$ . Write:

- (i) the order of the matrix X  
(ii) the matrix X. [3]

(c) A page from the Savings Bank Account of Mr. Prateek is given below:

Date	Particulars	Withdrawal (In ₹)	Deposit (In ₹)	Balances (In ₹)
January 1 <sup>st</sup> 2006	B/F	-	-	1270
January 7 <sup>th</sup> 2006	By Cheque	-	2310	3580
March 9 <sup>th</sup> 2006	To Self	2000	-	1580
March 26 <sup>th</sup> 2006	By Cash	-	6200	7780
June 10 <sup>th</sup> 2006	To Cheque	4500	-	3280
July 15 <sup>th</sup> 2006	By Clearing	-	2630	5910
October 18 <sup>th</sup> 2006	To Cheque	530	-	5380
October 27 <sup>th</sup> 2006	To Self	2690	-	2690
November 3 <sup>rd</sup> 2006	By Cash	-	1500	4190
December 6 <sup>th</sup> 2006	To Cheque	950	-	3240
December 23 <sup>rd</sup> 2006	By Transfer	-	2920	6160

If he receives ₹ 198 as interest on 1<sup>st</sup> January, 2007, find the rate of interest paid by the bank.

[4]

#### Question 6

(a) The printed price of an article is ₹ 60,000. The wholesaler allows a discount of 20% to the shopkeeper. The shopkeeper sells the article to the customer at the printed price. Sales tax (under VAT) is charged at the rate of 6% at every stage. Find:

- the cost to the shopkeeper inclusive of tax.
- VAT paid by the shopkeeper to the Government.
- the cost to the customer inclusive of tax.

[3]

(b) Solve the following inequation and represent the solution set on the number line:

$$4x - 19 < \frac{3x}{5} - 2 \leq \frac{-2}{5} + x, \quad x \in \mathbb{R}$$

[3]

(c) Without solving the following quadratic equation, find the value of 'm' for which the given equation has real and equal roots.

$$x^2 + 2(m-1)x + (m+5) = 0.$$

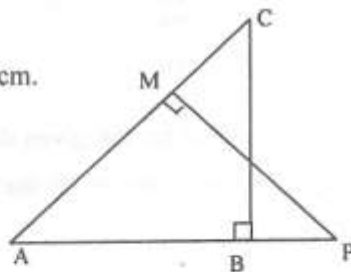
[4]

### Question 7

- (a) A hollow sphere of internal and external radii 6 cm and 8 cm respectively is melted and recast into small cones of base radius 2 cm and height 8 cm. Find the number of cones. [3]
- (b) Solve the following equation and give your answer correct to 3 significant figures:  
$$5x^2 - 3x - 4 = 0$$
 [3]
- (c) As observed from the top of a 80 m tall lighthouse, the angles of depression of two ships on the same side of the light house in horizontal line with its base are  $30^\circ$  and  $40^\circ$  respectively. Find the distance between the two ships. Give your answer correct to the nearest metre. [4]

### Question 8

- (a) A man invests ₹ 9600 on ₹ 100 shares at ₹ 80. If the company pays him 18% dividend find:  
(i) the number of shares he buys.  
(ii) his total dividend.  
(iii) his percentage return on the shares. [3]
- (b) In the given figure  $\triangle ABC$  and  $\triangle AMP$  are right angled at B and M respectively.  
Given  $AC = 10$  cm,  $AP = 15$  cm and  $PM = 12$  cm.  
(i) Prove  $\triangle ABC \sim \triangle AMP$   
(ii) Find AB and BC. [3]
- (c) If  $x = \frac{\sqrt{a+1} + \sqrt{a-1}}{\sqrt{a+1} - \sqrt{a-1}}$ , using properties of proportion show that  $x^2 - 2ax + 1 = 0$ . [4]





**Question 9**

- (a) The line through A (-2, 3) and B(4, b) is perpendicular to the line  $2x - 4y = 5$ . Find the value of b. [3]
- (b) Prove that  $\frac{\tan^2 \theta}{(\sec \theta - 1)^2} = \frac{1 + \cos \theta}{1 - \cos \theta}$  [3]
- (c) A car covers a distance of 400 km at a certain speed. Had the speed been 12 km/h more, the time taken for the journey would have been 1 hour 40 minutes less. Find the original speed of the car. [4]

**Question 10**

- (a) Construct a triangle ABC in which base BC = 6 cm, AB = 5.5 cm and  $\angle ABC = 120^\circ$ .
- (i) Construct a circle circumscribing the triangle ABC.
- (ii) Draw a cyclic quadrilateral ABCD so that D is equidistant from B and C. [4]
- (b) The following distribution represents the height of 160 students of a school.

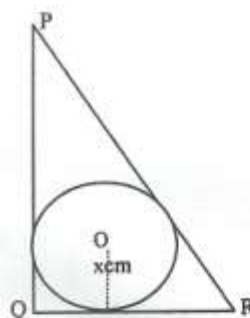
<u>Height (in cm)</u>	<u>No. of Students</u>
140 – 145	12
145 – 150	20
150 – 155	30
155 – 160	38
160 – 165	24
165 – 170	16
170 – 175	12
175 – 180	8

Draw an ogive for the given distribution taking 2 cm = 5 cm of height on one axis and 2 cm = 20 students on the other axis. Using the graph, determine:

- (i) The median height.
- (ii) The interquartile range.
- (iii) The number of students whose height is above 172 cm. [6]

**Question 11**

- (a) In triangle PQR,  $PQ = 24$  cm,  
 $QR = 7$  cm and  $\angle PQR = 90^\circ$ .  
Find the radius of the inscribed circle.



[3]

- (b) Find the mode and median of the following frequency distribution:

x	10	11	12	13	14	15
f	1	4	7	5	9	3

[3]

- (c) The line through  $P(5, 3)$  intersects y axis at Q.

- (i) Write the slope of the line.  
(ii) Write the equation of the line.  
(iii) Find the co-ordinates of Q.

[4]

