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ICSE 2001 : MATHEMATICS

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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.

*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.

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

Mathematical tables are provided.

SECTION A (40 Marks)

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

Question 1

A man borrows Rs. 5000/- at 12% compound interest per annum - interest payable every six months. He pays back Rs. 1800/- at the end of every six months. Calculate the third payment he has to make at the end of 18 months in order to clear the entire loan.

[5]

Question 2

Amit deposited Rs. 150/- per month in a bank for 8 months under the Recurring Deposit Scheme. What will be the maturity value of his deposits, if the rate of interest is 8% per annum and interest is calculated at the end of every month?

[4]

Question 3

Find the value of the constants a and b, if $(x - 2)$ and $(x + 3)$ are both factors of the

[6]

expression $x^3 + ax^2 + bx - 12$.

Question 4

[6]

Use graph paper for this question.

The point $P(5, 3)$ was reflected in the origin to get the image P' .

- Write down the coordinates of P' .
- If M is the foot of the perpendicular from P to the x -axis, find the coordinates of M .
- If N is the foot of the perpendicular from P' to the x -axis, find the coordinates of N .
- Name the figure $PMP'N$.
- Find the area of the figure $PMP'N$.

Question 5

In the given figure, the area enclosed between the two concentric circles is 770 cm^2 . If the radius of the outer circle is 21 cm , calculate the radius of the inner circle.

[5]



Question 6

The catalogue price of a colour T.V. is Rs. 24000/-. The shopkeeper gives a discount of 8% on the listed price. He gives a further off-season discount of 5% on the balance. But sales tax at 10% is charged on the remaining amount. Find:

[3]

- The sales tax amount a customer has to pay.
- The final price he has to pay for the colour T.V.

[3]

Question 7

- If $2\sin A - 1 = 0$, show that:
 $\sin 3A = 3\sin A - 4\sin^3 A$.

[4]

(b) Solve for x and give your answers correct to 2 decimal places.

[4]

$$x^2 - 10x + 6 = 0$$

SECTION B (40 Marks)

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

Question 8

(a) Two numbers are in the ratio of 3 : 5. If 8 is added to each number, the ratio becomes 2 : 3. Find the numbers.

[3]

(b) A function ' f ' is defined by $f(x) = 144 - 16x^2$. Calculate $f(2)$. Also find the value of x when $f(x) = 0$.

[3]

(c) Find the value of x , which satisfies the inequation:

[4]

$$-2 \leq \frac{1}{2} - \frac{2x}{3} \leq 1\frac{5}{6}, x \in \mathbb{N}.$$

Graph the solution on the number line.

Question 9

(a) Ramesh earns an annual salary of Rs. 1,40,000/-. He contributes Rs. 3,000/- per month to his provident fund and pays an annual premium of Rs. 16,000/- towards his Life Insurance Policy. Calculate the Income Tax he has to pay in the last month of the year, if his earlier income tax deductions for the first 11 months were of Rs. 250/- per month. Assume the following for calculating the Income Tax.

[5]

(i) **Standard deduction** : 1/3 of the total income subject to a maximum of Rs. 20,000/-.

(ii) **Slab for Income Tax** : **Income Tax**
Upto Rs. 50,000 : No tax

From Rs. 50,001 to Rs. 60,000 : 10% of the amount exceeding Rs. 50,000.

From Rs. 60,001 to Rs. 1,50,000 : Rs. 1,000 + 20% of the amount exceeding Rs. 60,000.

- (iii) Rebate on Tax : 20% of the total contribution to Provident Fund and Life Insurance subject to a maximum of Rs 12,000/-.
- (iv) Surcharge : 10% on the tax payable.

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

- (c) A(10, 5), B(6, -3) and C(2, 1) are the vertices of a triangle ABC. L is the midpoint of AB, and M is the midpoint of AC. Write down the coordinates of L and M. Show that $LM = \frac{1}{2} BC$. [3]

Question 10

- (a) Use a graph paper for this question. Draw a graph of $2x - y - 1 = 0$ and $2x + y = 9$ on the same axes. Use 2 cm = 1 unit on both axes and plot only 3 points for each line. Write down the coordinates of the point of intersection of the two lines. [4]

- (b) A, B and C are three points on a circle. The tangent at C meets BA produced at T. Given that $\angle ATC = 36^\circ$ and that the $\angle ACT = 48^\circ$, calculate the angle subtended by AB at the centre of the circle. [4]

- (c) Find x and y, if: [2]

$$\begin{bmatrix} -3 & 2 \\ 0 & -5 \end{bmatrix} \begin{bmatrix} x \\ 2 \end{bmatrix} = \begin{bmatrix} -5 \\ y \end{bmatrix}$$

Question 11 [10]

- (a) A man invests Rs. 8800/- on buying shares of face value of Rupees hundred each at a premium of 10% in a company. If he earns Rs. 1200/- at the end of the year as dividend, find:
- The number of shares he has in the company.
 - What is dividend percentage per share?
- (b) Construct a triangle ABC, in which $AC = 5$ cm, $BC = 7$ cm and $AB = 6$ cm.
- Mark D, the mid point of AB.

- (ii) Construct the circle which touches BC at C, and passes through D.
 (c) Write down the equation of the line whose gradient is $\frac{3}{2}$ and which passes through P, where P divides the line segment joining A(-2, 6) and B(3, -4), in the ratio 2 : 3.

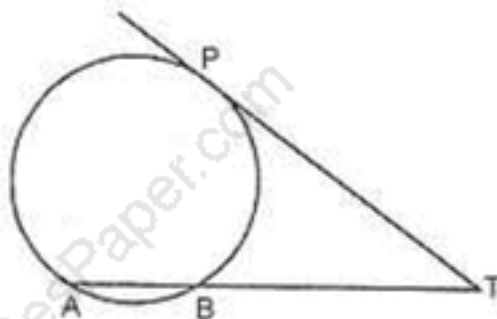
Question 12

- (a) A vertical tower is 20 m high. A man standing at some distance from the tower knows that the cosine of the angle of elevation of the top of the tower is 0.53. How far is he standing from the foot of the tower? [5]

- (b) An exhibition tent is in the form of a cylinder surmounted by a cone. The height of the tent above the ground is 85 m and the height of the cylindrical part is 50 m. If the diameter of the base is 168 m, find the quantity of canvas required to make the tent. Allow 20% extra for folds and for stitching. Give your answer to the nearest m^2 . [5]

Question 13

- (a) In the given figure find TP if AT = 16 cm and AB = 12 cm. [5]



- (b) In triangle ABC, $\angle B = 90^\circ$ and D is the mid point of BC. Prove that:-
 $AC^2 = AD^2 + 3CD^2$. [5]

Question 14

- (a) Using the data given below construct the cumulative frequency table and draw the ogive. From the ogive determine the median. [5]

Mark	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of Students	3	8	12	14	10	6	5	2

(b) Construct an isosceles triangle ABC such that $AB = 6$ cm, $BC = AC = 4$ cm. Bisect $\angle C$ internally and mark a point P on this bisector such that $CP = 5$ cm. Find the points Q and R which are 5 cm from P and also 5 cm from the line AB .

[5]