

(i) Printed Pages : 2

Roll No.

(ii) Questions : 8

Sub. Code :

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Exam. Code :

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B.A./B.Sc. (General) 1st Semester

(2123)

MATHEMATICS

Paper : II (Calculus-I)

Time Allowed : Three Hours]

[Maximum Marks : 30

Note :— Attempt **five** questions in all by selecting at least **two** questions from each unit. All questions carry equal marks.

UNIT-I

1. (a) Show that $\sqrt{2}$ is an irrational number. 3

(b) Find g.l.b. & l.u.b. of the set :

$$S = \{3\sin x + 4 \cos x \mid x \in \mathbb{R}\}. \quad 3$$

2. (a) Show that $\lim_{x \rightarrow 0} \frac{1}{x}$ does not exist. 3

(b) Find values of a and b so that :

$$f(x) = \begin{cases} 1 & \text{if } x \leq 3 \\ ax + b & \text{if } 3 < x < 5 \\ 7 & \text{if } x \leq 5 \end{cases}$$

is continuous at all x.

3

3. (a) Evaluate, $\lim_{x \rightarrow 0} (\cot^2 x - \frac{1}{x^2})$. 3

(b) Evaluate $\lim_{x \rightarrow 0} x^x$ 3

4. (a) Solve for x , $|3x - 5| < 2$. 3

(b) Use definition to show that $\lim_{x \rightarrow 1} x + 1 = 2$. 3

UNIT-II

5. (a) State & prove Leibnitz's Theorem. 3

(b) If $y = e^{m \sin^{-1} x}$ find $y_n(0)$. 3

6. (a) If $y = x^{\tanh x}$, find $\frac{dy}{dx}$. 3

(b) Find first three non zero terms in Maclaurin's expansion of $\sin x$. 3

7. (a) State & prove Rolle's Theorem. 3

(b) Find approximate value of $\sqrt{66}$. 3

8. (a) Show that $\frac{x}{1+x^2} < \tan^{-1} x < x, \forall x > 0$. 3

(b) State & prove Cauchy's mean value Theorem. 3