(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 1 0 4 7 4

Exam. Code : 5 0 0 2

NEP U.G. Common-Inter Disciplinary Course

2nd Semester

(2056)

MATHEMATICS

Paper : Basic Mathematics—II

Time Allowed : 3 Hours] **[Maximum Marks : 68**

Note :– Do **four** questions in all, including Question Number 1, and by selecting **one** question from each of the three Units.

1. (a) Evaluate $\lim_{x\to 2} \frac{x^3-2x^2}{x^2-5x+6}$.

(b) Show that $\lim_{x\to 0} x \sin\left(\frac{1}{x}\right) = 0$.

(c) Prove that the logarithmic function is increasing in the interval $(0, \infty)$.

(d) Evaluate $\frac{dy}{dx}$ when $y = \frac{e^x \log x}{x^2}$.

(e) Find $\frac{dy}{dx}$ if $x \cdot y = e^{x-y}$.

(f) Find the rate of change of the area per second of a variable circle with respect to its radius r when r = 5 cm.

(g) Evaluate the integral $\int \frac{dx}{x^2+16}$. 2×7=14

UNIT—I

2. (a) Evaluate $\lim_{x\to 1} \frac{x^{\frac{1}{3}}-1}{x^{\frac{1}{6}}-1}$

(b) Evaluate $\lim_{x\to\frac{\pi}{2}} \frac{\sin 2x}{x-\frac{\pi}{2}}$ 9×2=18

3. (a) Find the limit of the function $f(x) = |x+1| + |x+2|$ at $x = -1, -2$ and also discuss its continuity at these points.

(b) For what value of λ is the function defined by

$$f(x) = \begin{cases} x \sin\frac{1}{x} & \text{if } x \neq 0 \\ \lambda & \text{if } x = 0 \end{cases}$$ continuous? 9×2=18

UNIT—II

4. (a) Find the intervals in which the function $f(x) = e^{2x} - 4x + 17$ is increasing or decreasing.

(b) Find the intervals in which the function $f(x) = \sin x + \cos x$, $0 \le x \le 2\pi$ is strictly increasing or strictly decreasing.

9×2=18

5. (a) Show that $\frac{dy}{dx} = -\frac{y}{x}$ if $x = \sqrt{a^{\sin^{-1}t}}$ and $y = \sqrt{a^{\cos^{-1}t}}$

(b) Differentiate $y = \sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}$ with respect to x.

9×2=18

UNIT—III

6. (a) Evaluate the integral $\int e^x(\tan^{-1}x + \frac{1}{1+x^2})dx$.

(b) Evaluate the integral $\int x\sqrt{2-x}\,dx$. 9×2=18

7. (a) Two dice are thrown and the sum of the numbers which come up on the dice is noted. Among the following four possible events, which pairs are mutually exclusive?

A = sum is even,

B = sum is a multiple of 3,

C = sum is less than 4,

D = sum is greater than 11.

(b) The letters of the word "ARTICLE" are arranged at random. Find the probability that the vowels occupy even places. 9×2=18