

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9585

Roll No.

--	--	--	--	--	--	--	--	--	--

B.Tech.**(SEM. I) ODD SEMESTER THEORY****EXAMINATION 2013-14****ELEMENTARY MATHEMATICS-I****Time : 3 Hours****Total Marks : 100****Note :- Attempt all questions.****SECTION-A**

1. Attempt all parts of this question : (10×2=20)

(a) Evaluate $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$.

(b) Find the derivative of $y = 9x^2 + \frac{3}{x} + 5 \tan^{-1} x$ with respect to x .

(c) Find the critical points of $f(x) = 9x^2 + 12x + 2$.

(d) Find the slope of the tangent to the curve $y = x^3 - x$ at $x = 2$.

(e) Evaluate $\int \cos^3 x e^{\log \sin x} dx$.

(f) Evaluate $\int_0^{\pi} e^{-2x} \sin x dx$.

- (g) Find the order and degree of the differential equation

$$\frac{d^3y}{dx^3} - 6\left(\frac{dy}{dx}\right)^2 - 4y = 0.$$

(h) Solve: $\frac{dy}{dx} = e^{x-y}.$

- (i) Two coins are tossed once. Find the probability of getting two heads.

(j) If $P(A/B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{10}$, find $P(B).$

SECTION-B

2. Attempt any three parts of the following: $(3 \times 10 = 30)$

(a) Find $\frac{dy}{dx}$ if $y = \sin(\sqrt{\sin x + \cos x}).$

- (b) The length of a rectangle x is decreasing at the rate of 3cm/minute and the width y is increasing at the rate of 2cm/minute. Find the rates of change of the area and perimeter of the rectangle if $x = 10$ cm and $y = 6$ cm.

- (c) Find the area bounded by the parabola $y^2 = 4ax$ and its latus rectum.

(d) Solve: $(x+1)\frac{dy}{dx} - y = e^x(x+1)^2.$

- (e) An urn I contains 3 white and 4 red balls and urn II contains 5 white and 6 red balls. One ball is drawn at random from one of the urns and is found to be white. Find the probability that it was drawn from urn I.

SECTION-C

Note :- Attempt any two parts from each question of this Section.

$[(2 \times 5) \times 5 = 50]$

3. (a) Differentiate $y = x^2 e^x \sin x.$

(b) Evaluate $\lim_{x \rightarrow 0} \left(\frac{3^x - 2^x}{x} \right).$

(c) If $y = \left(\frac{1 - \tan x}{1 + \tan x} \right)$, show that $\frac{dy}{dx} = \frac{-2}{(1 + \sin 2x)}.$

4. (a) Find $f'(x)$ if $f(x) = (\sin x)^{\sin x}$ for all $0 < x < \pi.$

- (b) Find the equation of the tangent to the curve

$$y = \frac{x-7}{(x-2)(x-3)} \text{ at the point where it cuts the x-axis.}$$

- (c) Find the approximate change in the volume V of a cube of side x meters caused by increasing the sides by 2%.

5. (a) Evaluate $\int \frac{(x-1)}{(x+1)(x-2)} dx.$

- (b) Find the sum of the series as $n \rightarrow \infty$

$$\left[\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n} \right].$$

- (c) Show that $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx = \frac{\pi^2}{4}$.

6. (a) Obtain the differential equation if $y = a \cos x + b \sin x$.
(b) Find the general solution of the differential equation $(1 + x^2) dy + (1 + y^2) dx = 0$.
(c) Solve the differential equation :

$$\frac{dy}{dx} = \frac{y}{x} + x \sin \frac{y}{x}.$$

7. (a) In a single draw of two dice. Find the probability of obtaining a total of 8.
(b) A bag contains 6 white, 5 black and 4 yellow balls. Find the probability of getting either a white or a black ball in a single draw.
(c) An urn contains 3 red and 4 black balls. Two balls are taken out at random. Find the probability that the balls are of different colours.