



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

PAPER ID : 154101

Roll No.

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B. Tech.

(SEM. I) (ODD SEM.) THEORY
EXAMINATION, 2014-15
ENGINEERING MATHEMATICS - I

Time : 3 Hours]

[Total Marks : 100

SECTION - A

1 Attempt **all** parts of this question. **2×10=20**

Each part carries **two** marks :

(a) Find the derivative of $y = \cos x \cdot \sin x$ with respect to x .

(b) Evaluate $\lim_{x \rightarrow 4} \frac{4x+3}{x-2}$.

(c) State Mean Value theorem.

(d) Discuss the continuity of $f(x) = \frac{1}{x}$ such that $x \neq 0$.

(e) What is the rule for the calculating the integral of the product of two functions?

- (f) Evaluate $\int (4e^{3x} + 1) dx$.
- (g) Define Order and Degree of a differential equation.
- (h) Find the genral solution of $\frac{dy}{dx} = -4xy^2$.
- (i) A box contains 1 red and 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for this experiment. (
- (j) A die is thrown two times, find the sample space.

SECTION - B

2 Attempt any **three** parts of this question : **3×10=30**

- (a) Find the derivative of $f(x) = x^2$ using first fundamental principle.
- (b) Find the values of a and b such that the function defined

by $f(x) = \begin{cases} 5, & \text{if } x \leq 2 \\ ax + b, & \text{if } 2 < x < 10 \\ 21, & \text{if } x \geq 10 \end{cases}$ is a continuous function.

- (c) Evalute $\int e^x \sin x dx$.
- (d) Find the general solution of $\frac{dy}{dx} + (\sec x)y = \tan x$.

- (e) A die is thrown, find the probability of events :
- A prime number will appear.
 - A number greater than or equal to 3 will appear.
 - A number more than 6 will appear.
 - A number less than 6 will appear.
 - A number less than or equal to one appear.

SECTION - C

(Attempt any **two** parts from each question. **5×2×5=50**
All questions are compulsory.

- 3 (a) Evaluate $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$, $a, b \neq 0$.
- (b) Find the derivative of $(x-1)(x-2)$ with respect to x
- (c) If the function $f(x)$ satisfies $\lim_{x \rightarrow 1} \frac{f(x) - 2}{x^2 - 1} = \pi$, evaluate

$$\lim_{x \rightarrow 1} f(x).$$

- 4 (a) Find the point of discontinuity of

$$f(x) = \begin{cases} \frac{|x|}{x}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$$

- (b) Find derivative of $y = \sec(\tan(\sqrt{x}))$ using chain rule.
- (c) If $y = 5 \cos x - 3 \sin x$, prove that $\frac{d^2y}{dx^2} + y = 0$.

- 5 (a) Evaluate $\int \frac{1}{x^2 - 16} dx$ by partial function.
- (b) Evaluate integral of $\tan x$.
- (c) Find $\int_0^{\pi/2} \cos^2 x dx$.
- 6 (a) Solve the differential equation $x^5 \frac{dy}{dx} = -y^5$.
- (b) Find the general solution of the differential equation

$$x \frac{dy}{dx} + 2y = x^2 \quad (x \neq 0).$$
- (c) Find the differential equation representing the family of curves $y = mx$, where m is constant.
- 7 (a) A die is thrown up repeatedly until a six comes up. What is the sample space for this experiment ?
- (b) A coin is tossed two times. What is the probability of getting :
- i. Two heads
 - ii. One tail.
- (c) A fair coin with 1 marked on one face and 6 on the other and a fair die are both tossed.
 Find the probability that the sum of numbers that turn up is (i) 3 (ii) 12