

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, OCTOBER/NOVEMBER – 2019**

TECHNICAL MATHEMATICS-II

[Maximum Marks: 100]

[Time: 3 Hours]

PART-A

[Maximum Marks: 10]

(Answer **all** questions in one or two sentences. Each question carries 2 marks)

- I. 1. Evaluate $\lim_{x \rightarrow 1} \frac{2x+3}{4x-1}$
2. Check whether the function $x^3 - 6x^2 + 5x - 2$ is increasing at $x = 2$
3. Evaluate $\int_0^1 x^3(x^2 + 1)dx$
4. Solve $\frac{d^2 y}{dx^2} = \cos x$
5. Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos 2x}{x^2}$ (5x 2 = 10)

PART-B

[Maximum Marks: 30]

(Answer any **Five** of the following questions. Each question carries 6 marks)

- II. 1. Evaluate (i). $\lim_{x \rightarrow 2} \frac{x\sqrt{x}-2\sqrt{2}}{x-2}$ (ii). $\lim_{x \rightarrow \infty} \frac{6x^2-3x+2}{5x^2+7x-3}$
2. Using first principle, find derivative of $\sin x$.
3. A particle move such that the displacement from a fixed point O is given by $S=5\cos nt+ 4 \sin nt$, where n is a constant. Prove that acceleration is proportional to its displacement.
4. Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square.
5. Evaluate $\int e^x \cos x dx$.
6. Find the area bounded between the curves $x^2 = y$ and $y^2 = x$
7. Solve $\frac{dy}{dx} + y \tan x = \cos^3 x$ (5x 6 = 30)

PART-C

[Maximum Marks: 60]

(Answer **one** full question from each Unit. Each question carries 15 marks)

UNIT -I

III. (a). Evaluate $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x^2 - 9}$ (5)

(b). If $y = \frac{e^{2 \sin x}}{1 + \log x}$ find $\frac{dy}{dx}$ (5)

(c). Evaluate $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 + x - 6}$ (5)

OR

IV. (a). Find 'k' if $f(x) = \begin{cases} x^3 - 8 & \text{if } x \neq 2 \\ k & \text{if } x = 2 \end{cases}$ is continuous at $x = 2$ (5)

(b). If $x = 3 \cos \theta - \cos^3 \theta$
 $y = 3 \sin \theta - \sin^3 \theta$ find $\frac{dy}{dx}$ (5)

(c). If $y = x^2 \cos x$, show that $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + (x^2 + 6)y = 0$ (5)

UNIT -II

V. (a). The radius of a circular plate is decreasing in length at 0.2cm/sec. What is the rate at which area is decreasing when the radius is 6cm. (5)

(b). Find maximum value of $4x^3 + 9x^2 - 12x + 2$ (5)

(c). Find equation of tangent and normal to the semi circle $y = \sqrt{25 - x^2}$ at the point (4, 3) on it.

OR

VI. (a). The distance travelled by a particle moving along a straight line after time is $S = 2t^3 - 9t^2 + 12t + 6$. Find the time when acceleration is $6\text{cm}^2/\text{sec}$ and velocity at that time. (5)

(b). A spherical balloon is inflated with air such that volume increasing at the rate of 5cc per second. Find the rate at which its surface area is increasing when radius is 7cm (5)

(c). Find maximum and minimum values of $2x^3 + 3x^2 - 12x + 3$ (5)

UNIT –III

- VII. (a). Find $\int_0^{\frac{\pi}{2}} \sin x dx$ (5)
(b). Evaluate $\int \log x dx$ (5)
(c). Evaluate $\int \sin 3x \cos x dx$ (5)

OR

- VIII. (a). Evaluate $\int \sqrt{1 + \sin 2x} dx$ (5)
(b). Evaluate $\int_0^{\frac{\pi}{2}} \sin x dx$ (5)
(c). Evaluate $\int_1^2 \frac{x^2 + 1}{x^3 + 3x} dx$ (5)

UNIT -IV

- IX. (a). Show by integration that the volume of a right circular cone of height h and radius r is $\frac{1}{3} \pi r^2 h$ (5)
(b). Find area bounded by the curve $y = x^2 + x$ and the x -axis. (5)
(c). Solve $x(1+y^2) dx + y(1+x^2) dy = 0$ (5)

OR

- X. (a). Find the area enclosed between the curves $y = x^2$ and $2x+y-3=0$ (5)
(b). Find volume of the solid generated when the area bounded by the parabola $y = x^2$, the ordinates at $x = 0$ and $x = 2$ revolved about the e -axis. (5)
(c). Solve $\frac{d^2y}{dx^2} = xe^x + \cos x$ (5)