

SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/
TECHNOLOGY—OCTOBER, 2013

TECHNICAL MATHEMATICS-II
(Common except CABM and DCP)

[Time : 3 hours

(Maximum marks : 100)

PART—A

Marks

I Answer all questions. Each question carries 2 marks.

1. Find the derivative of $y = 3 \cos x - 4 \tan x$.
2. Evaluate $\lim_{x \rightarrow 0} \frac{2x - 3}{3x + 4}$
3. Check whether the function $x^2 - 3x + 2$ is decreasing at $x = 1$.
4. Find $\int (2x + 1)^2 dx$.
5. Solve $\frac{d^2y}{dx^2} = \sec^2 x$.

(5×2=10)

PART—B

II Answer any five of the following. Each question carries 6 marks.

1. (a) Find the derivative of $\tan x$ using quotient rule.
(b) Evaluate $\lim_{x \rightarrow \infty} \frac{x^2 - 2x + 8}{4x^3 - 3}$
2. If $y = \sin^{-1} x$, show that $(1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$.
3. For what value of x tangent to the curve $y = \frac{x}{(1-x)^2}$ will be parallel to :
(i) x -axis and (ii) y -axis
4. Find the minimum value of $y = 4x^3 + 9x^2 - 12x + 2$.
5. Find :
(a) $\int \frac{x^2 + 3x - 2}{x} dx$ (b) $\int \sin 3x \cos x dx$.
6. Find $\int \tan^{-1} x dx$.
7. Solve $\frac{dy}{dx} = \frac{xy^2 + x}{yx^2 + y}$.

(5×6=30)

PART—C

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

UNIT—I

- III (a) Using first principles, find the derivative of $\sin x$. 5
- (b) Find $\frac{dy}{dx}$ if :
- (i) $y = e^x \tan x$. 2
- (ii) $y = \log (\sec x + \tan x)$. 3
- (c) If $ax^2 + 2hxy + by^2 = 0$, find $\frac{dy}{dx}$. 5

OR

- IV (a) If $x = a(\theta + \sin \theta)$, $y = a(1 + \cos \theta)$, find $\frac{dy}{dx}$. 5
- (b) If $y = ae^x + be^{2x}$ show that $y'' - 3y' + 2y = 0$. 5
- (c) Find $\frac{d^2y}{dx^2}$ if $y = \sin x \cos x$. 5

UNIT—II

- V (a) If the displacement of a body is given by $s = 2t^3 - 3t^2 - 12t + 6$, find when the body attain the greatest height and also find the acceleration then. 5
- (b) A stone is dropped into still water. The radius of the outermost ripple then formed increases at the rate of 6 cms per second. How fast is the area increasing when the radius is 16 cms? 5
- (c) Show that a rectangle of fixed perimeter has its maximum area when it becomes a square. 5

OR

- VI (a) Find the range of values of x for which the function $x^2 - 3x + 4$ is : 5
- (i) increasing and (ii) decreasing.
- (b) Show that the maximum value of function $M = 2x^3 - 9x^2 + 12x$ is 5. 5
- (c) Water is running out of a conical funnel at the rate of 1 cubic inch per second. If the radius of the funnel is 4 inches and altitude is 8 inches, find the rate at which the water level is dropping when its depth is 6 inches. 5

UNIT—III

VII Evaluate :

- (a) $\int (2x^3 - 3 \sin x + 5x) dx$. 3
- (b) $\int \frac{3x^2 dx}{\sqrt{1-x^6}}$. 3
- (c) $\int x^2 e^x dx$. 4
- (d) $\int_0^{\frac{\pi}{2}} \frac{\cos x}{1 + \sin x} dx$. 5

OR

	Marks
VIII Find :	
(a) $\int (4 \sec^2 x + 3 \sin x + e^x) dx.$	3
(b) $\int_1^e \log x dx.$	3
(c) $\int_0^{\frac{\pi}{2}} \cos^2 x dx.$	4
(d) $\int (1 + e^{\tan x}) \sec^2 x dx.$	5

UNIT—IV

IX (a) Find the area enclosed between the curve $y = x^2 - x + 1$. The x axis and the ordinate $x = 1$ and $x = 3$.	5
(b) Find the volume of the sphere obtained by rotating the circle $x^2 + y^2 = a^2$ about the x- axis is $\frac{4}{3} \pi a^3$.	5
(c) Solve $\frac{dy}{dx} + \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}} = 0.$	5

OR

X (a) Find the area enclosed between one arch of the curve $y = \sin x$ and the x-axis.	5
(b) Find the volume of the solid obtained by rotating the area under the parabola $y^2 = 4x$ between the ordinate at $x = 0$, $x = 2$ and the x-axis.	5
(c) Solve $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x.$	5