TED (10)–1015 Reg. No. ....

(REVISION–2010) Signature ....

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 $\underset{x \to 0}{\text{Lt}} \dfrac{2x - 3}{3x + 4}$
3. Check whether the function $x^2 - 3x + 2$ is decreasing at $x = 1$.
4. Find $\int (2x + 1)^2 \, dx$.
5. Solve $\dfrac{d^2y}{dx^2} = \sec^2 x$. (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 $\underset{x \to \alpha}{\text{Lt}} \dfrac{x^2 - 2x + 8}{4x^3 - 3}$

2. If $y = \sin^{-1} x$, show that $(1-x^2)\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} = 0$.
3. For what value of x tangent to the curve $y = \dfrac{x}{(1-x)^2}$ 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) $\int \dfrac{x^2 + 3x - 2}{x} \, dx$ (b) $\int \sin 3x \cos x \, dx$.

6. Find $\int \tan^{-1} x \, dx$.
7. Solve $\dfrac{dy}{dx} = \dfrac{xy^2 + x}{yx^2 + y}$. (5×6=30)

Marks

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 :

(i) increasing and (ii) decreasing. 5

(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 $\frac{dy}{dx} + \sqrt{\frac{1 - y^2}{1 - x^2}} = 0.$ 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