TED (10)–1015

(REVISION—2010)

Reg. No. .....

Signature .....

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

TECHNICAL MATHEMATICS – II

(Common except DCP and CABM)

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A

I Answer *all* questions. Each question carries 2 marks.

1. Evaluate $\lim_{x \to 0} \frac{x^2 + 4}{x + 1}$.
2. Find $\frac{dy}{dx}$ if $y = x^2 \sin x$.
3. Find $\int \tan^2 x \, dx$.
4. Solve $\frac{dy}{dx} = 5y$.
5. Find the slope of the tangent to the curve $y = 2x^3 - 9x^2 + 12x - 3$ at the point (1,1). (5x2=10)

PART—B

II Answer *any five* questions. Each question carries 6 marks.

1. (a) Evaluate $\lim_{x \to 0} \frac{1-\cos 2x}{x^2}$.

   (b) If $y = (2x^2 + 5x + 1)^{10}$, Find $\frac{dy}{dx}$.
2. If $y = a\cos px + b\sin px$, where a, p and b are constants. Show that $\frac{d^2y}{dx^2}$ is proportional to y.
3. Find the equation of the tangent and normal to the curve, $y = x^2 + x - 1$ at (2, 7).
4. If $y = 2x^3 - 3x^2 - 36x + 10$, find its minimum value.
5. Obtain : (a) $\int \frac{3 \cos x + 4}{\sin^2 x} dx$ (b) $\int \frac{2x^4}{1 + x^{10}} dx$.
6. Evaluate $\int_0^2 x^3 \log x \, dx$.
7. Solve $(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1}x}$. (5x6=30)

Marks

PART—C

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

UNIT – I

III 1. Find $\frac{dy}{dx}$ if $y = \frac{x \text{ Sec } x}{3x + 2}$. 5

2. Evaluate $\underset{x \to 3}{\text{Lt}} \frac{x^3 - 27}{x^4 - 81}$. 5

3. Using first principles, find the derivatives of cos x. 5

OR

IV 1. If $x^3 + y^3 = 3axy$, find $\frac{dy}{dx}$. 5

2. If $xy = ax^2 + \frac{b}{x}$, show that $x^2 y^{II} - 2xy^I - 2y = 0$. 5

3. If $y = \frac{\text{Sin } 2x}{1 + \cos 2x}$, find $\frac{dy}{dx}$. 5

UNIT – II

V 1. Find the velocity and acceleration of a body at t = 2 seconds, if the displacement at time t is given by $S = 2t^3 - 3t^2 + 12t + 6$. 5

2. A balloon is spherical in shape. Gas is filling into it at the rate of 10 cc/sec. How fast is the surface area increasing when the radius is 15 cm ? 5

3. The deflection of a beam is $y = 2 (100\ x - x^2)$. Find the maximum deflection. 5

OR

VI 1. Show that function $x^3 - 3x^2 + 3x + 7$ is increasing for all real values of x. 5

2. The sand falls into a conical pile at the rate of 10 cc/sec and the radius of the pile is always equal to half of its altitude. How fast is the altitude of the pile increasing, when altitude is 150 cm ? 5

3. An open box is to be made out of a square sheet of side 18 cm by cutting off equal squares at each corner and turning up the sides. What size of the squares should be cut in order that the volume of the box may be maximum ? 5

UNIT – III

VII Find :

1. $\int (\text{Sec}^2 x + e^x - 5)\ dx$. 3

2. $\int \tan^3 x \sec^2 x\ dx$. 3

3. $\int_1^2 \frac{1}{9x^2 - 4}\ dx$. 4

4. $\int_0^{\pi/2} x \cos x\ dx$. 5

OR

Marks

VIII Find :

1. $\int(\text{Sin } x + 1/x + \text{cosec}^2 x)dx.$ 3

2. $\int \frac{e^{2x}}{(1 + e^{2x})} dx.$ 3

3. $\int x \log x \, dx.$ 4

4. $\int_0^1 \text{Sin}^{-1} x \, dx.$ 5

Unit – IV

IX 1. Find the area enclosed between the curve $x = y^2 - 2y$, y-axis and the ordinate at $y = 1$ and $y = 2$. 5

2. Show by integration that the volume of a right circular cone of height h and base radius r is $\frac{1}{3}\pi r^2 h$. 5

3. Solve $\frac{d^2y}{dx^2} = x e^x + \cos x$. 5

Or

X 1. Find the area bounded by the parabola $x^2 = y$ and $y^2 = x$. 5

2. Find the volume of the solid obtained by rotating the area under the curve $y = x^2 + 1$ between $x = 0$ and $x = 1$. 5

3. Solve $(x^2 + 1)\frac{dy}{dx} + 2xy = 4x^2$. 5