TED (10)–1015

(REVISION—2010)

Reg.No.....

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SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2011

TECHNICAL MATHEMATICS–II

[*Time :* 3 hours

(Maximum marks : 100)

PART—A

(Answer the following questions. Each question carries 2 marks)

Marks

I 1. $\lim_{x \to a} \frac{x^{3/5} - a^{3/5}}{x^{1/3} - a^{1/3}}$

2. State product rule and quotient rule.

3. The displacement of a particle moving in a straight line is given by : $S = ae^{nt} + be^{-nt}$. Find the velocity and acceleration.

4. Evaluate : $\int \text{Cosec}\,(9x+7)\cot(9x+7)\,dx$.

5. Solve $\frac{dy}{dx} + y \tan x = \cos^2 x$. (5×2=10)

PART—B

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

II 1. (a) Evaluate $\lim_{x \to \alpha} \frac{x^2 - 4x + 8}{4x^3 + 8}$ 3

(b) If $y = a \cos mx$ show that $\frac{d^2y}{dx^2} + m^2y = 0$ 3

2. (a) If $y = \log \sin\sqrt{x}$ Find $\frac{dy}{dx}$. 3

(b) Prove that $f(x) = \begin{cases} 3x-2, & x \le 0 \\ x+1, & x > 0 \end{cases}$ is discontinuous at $x = 0$. 3

3. (a) Find the slope of the curve $y = x^2 - 4x$ at the point $(2, -4)$. 3

(b) A particle is projected vertically upwards. Its height 'h' and time 't' are connected by $h = 60t - 16t^2$. Find the greatest height attained. 3

4. (a) A particle moves such that the displacement from a point 'o' is always given by $S = 5 \cos nt + 4 \sin nt$. Where 'n' is a constant. Prove that the acceleration varies as the displacement. 3

(b) Find the range of values of 'x' for which $(x^2 - 2x + 3)$ is :
(i) increasing (ii) decreasing 3

Marks

5. (a) Evaluate $\int \frac{3x^2}{\sqrt{1-x^6}}\,dx$ 3

(b) Evaluate $\int x\, e^{-x}\,dx$. 3

6. (a) Evaluate $\int e^{\cos x} \sin x\,dx$. 3

(b) Evaluate $\int_1^{\alpha} \frac{dx}{1+x^2}$. 3

7. (a) Calculate the entire area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ 4

(b) Solve $\frac{dy}{dx} - 10y = 0$. 2

PART—C

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

UNIT—I

III 1. Evaluate $\underset{\theta \to 0}{Lt} \frac{\tan 3\theta + \sin 5\theta}{8\theta}$ 4

2. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, prove that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$ 6

3. Find $\frac{dy}{dx}$ if $x = 3\cos\theta - \cos^3\theta$
$y = 3\sin\theta - \sin^3\theta$ 5

OR

IV 1. By the method of first principle, find the derivative of cos x. 5

2. Find $\frac{dy}{dx}$ if $y = \log(2x+3)\, e^{2x}$. 4

3. If $y = \sin(m \sin^{-1} x)$ prove that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + m^2y = 0$ 6

UNIT—II

V 1. The radius of a circular plate is decreasing in length at 0.2 cm/sec. What is the rate at which the area is decreasing when the radius is 6 cm ? 5

2. Find the minimum value of $2x^3-3x^2-36x+10$. 5

3. A spherical rubber bladder of radius 3 inches has air pumped into it. If the radius increases at a uniform rate of 1 inch/minute. Find the rate at which the volume is increasing at the end of 2 minutes. 5

OR

Marks

VI 1. Find the equation of the tangent and normal to the curve $x^2+y^2 = 25$ at (3, –4). 6

2. If 's' denotes the displacement of a particle at the time 't' seconds and $S = t^3 - 6t^2 + 8t - 4$. Find the time when the acceleration is 12 cm/sec^2 and the velocity at that time. 6

3. Find the slope of the normal to the curve $y = x^2 + x - 1$ at (2, 7). 3

UNIT—III

VII 1. Evaluate $\int (\tan x + \cot x)^2 dx$. 3

2. Evaluate $\int \sin^2 (5x) dx$. 3

3. Evaluate $\int \tan^5 x \sec^2 x \, dx$. 3

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

5. Evaluate $\int_0^{\frac{\pi}{2}} \sin x (1 - \cos x)^5 dx$. 3

OR

VIII 1. Evaluate $\int \frac{x^2 + 2x + 1}{x^2} dx$. 3

2. Evaluate $\int \frac{1}{\sqrt{3x + 4}} dx$. 3

3. Evaluate $\int e^x \operatorname{cosec}^2 (e^x) dx$. 3

4. Evaluate $\int \sin^{-1} x \, dx$. 3

5. Evaluate $\int_0^{\pi} \frac{1 - \sin x}{x + \cos x} dx$. 3

UNIT—IV

IX 1. Find the area of a circle of radius 'r' using integration. 5

2. Find the volume generated by the rotation of the area bounded by the curve $y = 2x^2 + 1$, the y axis and the line $y = 3$, $y = 9$ about the y– axis. 5

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

OR

X 1. Find the area bounded by the curve $y = x^2 + x$ and the x- axis. 5

2. Find the volume of solid obtained by rotating one arch of the curve $y = \sin 3x$ about the x-axis. 5

3. Solve $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1} x}$ 5