Mohd Iqbal.

TED (10)–1015

(REVISION—2010)

Reg. No. ....

Signature ....

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

TECHNICAL MATHEMATICS–II

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Answer *all* questions. Each question carries 2 marks.)

Marks

I (a) Evaluate $\underset{\theta \to 0}{\text{Lt}} \dfrac{\sin 5\theta}{6\theta}$.

(b) If $y = \sin^2 x$, find $\dfrac{dy}{dx}$.

(c) For what values of x will the tangent to the curve $y = \dfrac{x}{x^2+1}$ be parallel to the x – axis.

(d) Find $\int \cot x \, dx$.

(e) Solve $\dfrac{d\theta}{dt} = -\dfrac{5}{2}\theta$.

(5×2=10)

PART—B

(Answer any *five* questions. Each question carries 6 marks.)

II (a) Evaluate :

(i) $\lim\limits_{x \to -2} \dfrac{x^3+8}{x+2}$ 3

(ii) Examine whether the function given by $f(x) = \begin{cases} x^2+3 & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$ is continues or not at x = 0. 3

(b) Find $\dfrac{dy}{dx}$ if :

(i) $y = (1 - 2x + 7x^2)^{10}$

(ii) $y = \log(\text{Cosec } x - \text{Cot } x)$. (3+3)

(c) The distance 'S' meters travelled by a particle is given by $s = ae^{2t} + be^{-2t}$ where 't' represents the time. Prove that the acceleration varies as the distance. 6

(d) The bending moment of a rod 10m long and weighing 40 kg and resting on supports at its ends at a distance of x metres from one end is given by $M = 2(10x - x^2)$. Find the maximum bending moment. 6

(e) Integrate with respect to x :

(i) $\dfrac{1 + \operatorname{Sin} x}{\operatorname{Cos}^2 x}$

(ii) $\operatorname{Cos}^2 2x$

(f) Find $\int_0^2 x^2 \log x \, dx$.

(g) Solve $(1 + x^2) \dfrac{dy}{dx} + y = e^{\tan^{-1} x}$

PART—C

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

UNIT—I

III (a) Evaluate $\lim\limits_{x \to 0} \dfrac{\sqrt{1+x} - 1}{x}$

(b) If $y = \dfrac{x \tan^{-1} x}{1 + x^2}$, find $\dfrac{dy}{dx}$

(c) Using 1st principles, find the derivative of Cos x.

(d) If $y = \operatorname{Sin}^{-1} x$ prove that $(1 - x^2) y'' - xy' = 0$

OR

IV (a) State the product and quotient rule of differentiation.

(b) Find $\dfrac{dy}{dx}$ if :

(i) $y = \dfrac{1 + \operatorname{Cos} x}{(x + \operatorname{Sin} x)^3}$

(ii) $y = \log\left(x + \sqrt{1 + x^2}\right)$

(iii) $\operatorname{Sec}^2 (e^x)$. (3+3+

(c) If $x = a(\theta + \operatorname{Sin} \theta)$

$y = a(1 - \operatorname{Cos} \theta)$, prove that $\dfrac{dy}{dx} = \tan(\theta/_2)$.

UNIT—II

V (a) Find the equation of the tangent and normal to the curve $y = 2 \log x$ at the point (1, 0).

(b) A circular patch of oil spreads out on water at the rate of 12 sq. cm/min. How fast is the radius increasing when the radius is 2 cms.

(c) An open box is to be made out of a square sheet of side 18 cms. 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.

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

$(a+b)^2$ $a^2+2ab+b^2$

$\tan^2 x + 2\tan\ldots$

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