S2 ARC (Comm)

TED (10) – 1015 Reg. No. .....

(REVISION — 2010) Signature .....

SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — MARCH, 2015

TECHNICAL MATHEMATICS – II

(Common except DCP and CABM)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Maximum marks : 10)

Marks

I Answer all questions. Each question carries 2 marks.

1. Evaluate $\lim_{x \to 1} (x - 1)$.
2. Find the derivative of 1 + tanx with respect to x.
3. Find the rate of change of volume of a cube with respect to its side.
4. Integrate $(x^2 + 1)$ with respect to x.
5. Find the order of the differential equation $\frac{dy}{dx} = ky$. (5×2=10)

PART—B

(Maximum marks : 30)

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

1. Find the derivative of x^3 using first principle.
2. If $x = at^2$, $y = 2at$, find $\frac{dy}{dx}$.
3. Find the equation to the tangent and normal to the curve $y = 3x^2 + x - 2$ at (1, 2).
4. Integrate $x^2.e^{-3x}$ with respect to x.
5. Evaluate $\int_0^{\pi} \frac{1}{1 - \sin x} dx$.
6. Find the area bounded by the curve $y = x + \sin x$, the x – axis between $x = 0$ and $x = \frac{\pi}{2}$.
7. Solve $(1 + x) \frac{dy}{dx} - y = (1 + x)^2$. (5×6=30)

Marks

PART—C

(Maximum marks : 60)

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

UNIT—I

III (a) If $y = \frac{\cos x}{x + \sin x}$, find $\frac{dy}{dx}$. 5

(b) If $y = \log(\sec x + \tan x)$, prove that $\frac{dy}{dx} = \sec x$. 5

(c) If $y = x.\ \sin x$, prove that $y^{11} + y = 2\cos x$. 5

OR

IV (a) If $x = \cos t + t.\ \sin t$, $y = \sin t - t.\ \cos t$, find $\frac{dy}{dx}$. 5

(b) If $y = e^x.\ \log(\sin x)$, find $\frac{dy}{dx}$. 5

(c) If $y = \log\left[x + \sqrt{(x^2 + 1)}\right]$, find $\frac{dy}{dx}$. 5

UNIT—II

V (a) Find the values of x for which the tangent to the curve $y = \frac{x}{1-x}$ will be parallel to the y – axis. 5

(b) A particle projected vertically upwards and its height h and time t are connected by $h = 60t - 15t^2$. Find the greatest height attained. 5

(c) A spherical balloon is inflated by pumping 20 cc of gas per second. Find the rate at which the radius of the balloon is increasing, when the radius is 1. 5

OR

VI (a) Find the range of values of x for which $x^2 + 3x - 4$ is :

(i) increasing (ii) decreasing 5

(b) The deflection of a beam is given by $y = 2x^3 - 9x^2 + 12x$. Find the maximum deflection. 5

(c) The sum of the diameter and length of an open cylindrical vessel is 40 cm. Prove that the maximum volume is obtained when the radius is equal to the length. 5

UNIT—III

VII (a) Integrate $(\tan x - \cot x)^2$ with respect to x. 5

(b) Integrate $\cos^3 2x$ with respect to x. 5

(c) Show that $\int \sec x\, dx = \log(\sec x + \tan x) + c$. 5

OR

Marks

VIII (a) Integrate $\tan^5 x . \sec^2 x$ with respect to x. 5

(b) Show that $\int \tan x \, dx = \log(\sec x) + c$. 5

(c) Integrate $x^2 . \sin x$ with respect to x. 5

UNIT—IV

IX (a) Find the area between the curves $x^2 = 4y$ and $y^2 = 4x$. 5

(b) Find the volume of the solid generated by revolving one arch of the curve $y = 3 \sin 2x$ about the x – axis. 5

(c) Solve $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x$. 5

OR

X (a) Solve $3e^x \tan y \, dx + (1 - e^x) \sec^2 y \, dy = 0$. 5

(b) Obtain the area enclosed between the parabola $y = x^2 - x - 2$ and the x – axis. 5

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