TED (15) – 1002 Reg. No. ....

(REVISION — 2015) Signature ....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY — APRIL, 2017

ENGINEERING MATHEMATICS – I

(Common to all Diploma Programmes)

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer all questions. Each question carries 2 marks.

1. Evaluate $\lim_{x\to 3} \frac{x^3 - 27}{x - 3}$
2. If tan A = 3/4 and A is acute, find sin 2A.
3. In a triangle ABC, A = 45° B = 60° a = 5cm. Find b.
4. Evaluate 4 $\sin^3 60 - 3\cos 30$.
5. Find the slope of the curve $y = 3x^2 + x - 2$ at (1, 2). (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Express $\sqrt{3}\cos x + \sin x$ in the form R sin (x + α) where α is acute.
2. If A + B = 45°, show that (1 + tanA) (1 + tanB) = 2.
3. Show that cos20° cos40° cos60° cos80° = $\frac{1}{16}$.
4. Differentiate 'sin x' by method of first principles.
5. If $y = x^2 \sin x$ prove that $x^2y'' - 4xy' + (x^2 + 6)y = 0$.
6. The distance S metres travelled by a particle is given by $S = ae^{nt} + be^{-nt}$ where t represents the time. Show that the acceleration varies as the distance.
7. A balloon is spherical in shape. Gas is escaping from it at the rate of 10cc/sec. How fast is the surface area shrinking, when the radius is 15cm.

(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) Prove that $\frac{cosec\,\theta}{cosec\,\theta - 1} + \frac{cosec\,\theta}{cosec\,\theta + 1} = 2\sec^2\theta$ 5

(b) If tanA = 3/4, sinB = 5/13. A lies in third quadrant and B lies in second quadrant. Find sin(A – B) and cos (A + B). 5

(c) Evaluate cos570 sin510 – sin330 cos390. 5

OR

IV (a) Prove that $\sin(\pi/3 + A) - \sin(\pi/3 - A) = \sin A$. 5

(b) If tanx = 7/24 and x is in 3rd quadrant. Find the value of 3sinx – 4cosx. 4

(c) Find the value of tan 75 without using tables and show that tan 75 + cot75 = 4. 6

UNIT — II

V (a) Prove that $\frac{(\sin 2A + \sin 5A - \sin A)}{\cos 2A + \cos 5A + \cos A} = \tan 2A$ 5

(b) Show that $\frac{1 + \cos 2A}{\sin 2A}$ = cotA and deduce the value of cot 15. 5

(c) Solve triangle ABC, given a = 4cm b = 5cm c = 7cm. 5

OR

VI (a) Prove that $\frac{\sin 3A}{\sin A} - \frac{\cos 3A}{\cos A} = 2$. 5

(b) Show that cos 55 + cos65 + cos175 = 0. 5

(c) Prove that $R(a^2 + b^2 + c^2) = abc(\cot A + \cot B + \cot C)$. 5

UNIT — III

VII (a) Evaluate : $\lim_{x \to 3} \frac{x^3 - 64}{x^2 - 16}$ 4

(b) Find $\frac{dy}{dx}$, if (i) $y = \log \sin \sqrt{x}$ (ii) $\frac{(x^2 \sec x)}{(x^2 + 3)}$ 6

(c) If x = a (cost + t sint) y = a(sint – tcost), find $\frac{dy}{dx}$ 5

OR

VIII (a) Find $\frac{dy}{dx}$ if : (i) $y = \cot^5(x^2)$ (ii) $\frac{\sin(\log x)}{x}$ 6

(b) Find $\frac{dy}{dx}$, if $x^2y^2 = x^3 + y^3 + 3xy$. 5

(c) Find the derivative of cotx using quotient rule. 4

Marks

Unit — IV

IX (a) Find the equations to the tangent and normal to the curve $y = \cos x$ at $x = \pi/6$. 5

(b) If S denotes the displacement of a-particle at the time t secs and $S = t^3 - 6t^2 + 8t - 4$, find the time when the acceleration is $12 cm/sec^2$. Find the velocity at that time. 5

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

Or

X (a) Find the values of x for which the tangent to the curve $y = \frac{x}{(1-x)^2}$ will be parallel to the (i) X axis, (ii) Y axis. 5

(b) A spherical rubber bladder of radius 3" has air pumped into it. If the radius increases at a uniform rate of 1" per minute, find the rate at which the volume is increasing at the end of 3 minutes. 5

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