TED (15) – 1002

(REVISION — 2015)

Reg. No. ..........................................

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# DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

## ENGINEERING MATHEMATICS – I

[*Time* : 3 hours

(Maximum marks : 100)

## PART — A

(Maximum marks : 10)

Marks

I Answer all questions. Each question carries 2 marks.

1. Prove that $(1 + \cos A)(1 - \cos A) = \sin^2 A$
2. Find the value of $3\sin 15° - 4\sin^3 15°$
3. Find $\frac{dy}{dx}$ if $y = x^3 \tan x$.
4. Find the rate of change of volume V with respect to the side of a cube.
5. Find the area of triangle ABC given B = 3cm, C = 2cm and A = 30°

(5×2 = 10)

## PART — B

(Maximum marks : 30)

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

1. Prove that $\left(\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1}\right) = \frac{1 + \sin\theta}{\cos\theta}$
2. If $\tan A = \frac{m}{m+1}$, $\tan B = \frac{1}{2m+1}$ A and B are acute angles. Prove that A + B = 45°
3. Prove that $\sin 20°. \sin 40°. \sin 80° = \frac{\sqrt{3}}{8}$
4. Prove that $R(a^2 + b^2 + c^2) = abc\,(\cot A + \cot B + \cot C)$ where R is radius of circumcircle.
5. Differentiate $x^n$ by method of first principles.
6. A particle moves such that the displacement from a fixed point 'o' is always given by $S = 5\cos(nt) + 4\sin(nt)$ where n is a constant. Prove that the acceleration varies as its displacement S at the instant.
7. Find the equation to the tangent and normal to the curve $y = 3x^2 + x - 2$ at (1,2).

(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) Prove that $\left(\frac{1 + \sin A}{\cos A}\right) = \left(\frac{\cos A}{1 - \sin A}\right)$ 5

(b) Prove that $\frac{\cos(90 + A) \sec (360 + A) \tan (180 - A)}{\sec (A - 720) \sin (540 + A) \cot (A - 90)} = 1$ 5

(c) If $\sin A = \frac{-4}{5}$ and A lies in third quadrant, find all other trigonometric functions. 5

OR

IV (a) If cos A = 3/5, tan B = 5/12, A and B are acute angles, find the values of sin (A + B) and cos (A–B). 6

(b) Prove that $\frac{\tan 45 - \tan 30}{1 + \tan 45 \tan 30} = 2 - \sqrt{3}$ 4

(c) Express 5 sinx – 12 cosx in the form $R\sin (x - \alpha)$ 5

UNIT — II

V (a) Prove that sin 33 + cos 63 = cos 3 5

(b) Show that $(a-b) \cos \frac{C}{2} = c \sin\frac{A-B}{2}$ 5

(c) Solve triangle ABC, given a = 2cm b = 3cm c = 4cm 5

OR

VI (a) Prove that $\cos \frac{\pi}{8} + \cos\frac{3\pi}{8} + \cos\frac{5\pi}{8} + \cos\frac{7\pi}{8} = 0$ 5

(b) Prove that $2 [bc\cos A+ca\cos B+ab\cos C] = a^2+b^2+c^2$ 5

(c) Two angles of a triangular plot of land are 53°17' and 67°9' and the side between them is measured to be 150m. How many metres of fencing is required to fence the plot ? 5

UNIT — III

VII (a) Evaluate $\lim_{x \to 0} \frac{\sqrt{(1+x)} - 1}{x}$ 4

(b) Find $\frac{dy}{dx}$, if (i) $y = \frac{\cot 11x}{(x^3 - 1)^2}$ (ii) $(x^2+1)^{10} \sec^5 x$ (3+3)

(c) If $x = a(\theta + \sin\theta)$ $y = a(1- \cos\theta)$ find $\frac{dy}{dx}$ 5

OR

Marks

VIII (a) Find the derivative of cotx using quotient rule. 5

(b) If $y = \sin^{-1} x$ prove that $(1-x^2)\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} = 0$ 5

(c) If x and y are connected by the relation $ax^2 + 2hxy + by^2 = 0$ find $\dfrac{dy}{dx}$. 5

UNIT — IV

IX (a) Show that all the points on the curve $x^3 + y^3 = 3axy$ at which the tangents are parallel to the x-axis lie on the curve, $ay = x^2$. 5

(b) A spherical balloon is inflated by pumping 25cc of gas per second. Find the rate at which the radius of the balloon is increasing when the radius is 15 cm. 5

(c) The deflection of a beam is given by $y = 4x^3 + 9x^2 - 12x + 2$. Find the maximum deflection. 5

OR

X (a) Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square. 5

(b) A circular patch of oil spreads out on water, the area growing at the rate of 6 sq.cm per minute. How fast is the radius increasing when the radius is 2cms.? 5

(c) The distance travelled by a moving body is given by $S = 2t^3 - 9t^2 + 12t + 6$. Find the time when the acceleration is zero. 5