TED (15) – 1002 Reg. No. ....

(REVISION — 2015) Signature ....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

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. Find the value of $\tan^2 60 + \tan^2 45$.
2. If $\tan \theta = 3$, find $\sin 2\theta$.
3. Find the area of a triangle given, b = 3cm, c = 2cm and A = 30°.
4. Evaluate $\lim_{x \to 3} \frac{x^2 + 9}{x + 3}$
5. For what values of x, the function $x^2 - 5x + 6$ is increasing ? (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Find the value of tan 75, without using tables and show that $\tan 75 + \cot 75 = 4$.
2. The horizontal distance between two towers is 60 m and the angle of depression of the first tower as seen from the second which is in 150 m height is 30°. Find the height of the first tower.
3. Prove that $\cos\frac{\pi}{8} + \cos\frac{3\pi}{8} + \cos\frac{5\pi}{8} + \cos\frac{7\pi}{8} = 0$
4. Solve ΔABC, given a = 4cm, b = 5cm, c = 7cm.
5. Find the second derivative of $x^2 \log x$.
6. Differentiate 'sin x' by the method of first principles.
7. If S denotes the displacement of a particle at the time 't' seconds and $S = t^3 - 6t^2 + 8t - 4$.
   (i) Find the time when the acceleration is $12 cm/sec^2$.
   (ii) The velocity at that time. (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 $\frac{\text{cosec}\theta}{\text{cosec}\theta - 1} + \frac{\text{cosec}\theta}{\text{cosec}\theta + 1} = 2\sec^2\theta$ 5

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

(c) Evaluate cos 570 sin 510 – sin 330 cos 390. 5

Or

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

(b) Express $\sqrt{3}\sin x + \cos x$ in the form of $R\sin(x + \alpha)$ where α is acute. 5

(c) Prove that $\sin(A + B)\sin(A - B) = \sin^2 A - \sin^2 B$. 5

Unit — II

V (a) Prove that $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$ 5

(b) Prove that cos 80 cos 60 cos 40 cos 20 = 1/16 5

(c) Show that $a(b^2 + c^2)\cos A + b(c^2 + a^2)\cos B + c(a^2 + b^2)\cos C = 3abc$ 5

Or

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

(b) Show that sin 40 – sin 80 + sin 20 = 0 5

(c) Two angles of a triangular plot of land are 53° and 67° and the side between them is measured to be 100cm. How many meters of fencing is required to fence the plot ? 5

Unit — III

VII (a) Evaluate (i) $\lim_{x \to \infty} \frac{3x+5}{x-2}$ (ii) Evaluate $\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$ (3 + 2)

(b) Find $\frac{dy}{dx}$ if (i) $x = at^2$, $y = 2at$.

(ii) $y = \frac{\sin 2x}{1 + \cos 2x}$ (3 + 2)

(c) If $y = a\sin x + b\cos x$. Prove that $\frac{d^2y}{dx^2} + y = 0$ 5

Or

Marks

VIII (a) Find the derivative of 'sec x' using quotient rule. 5

(b) Find $\frac{dy}{dx}$ if (i) $y = \log(\sin\sqrt{x})$ (ii) $y = (x^3 + 3)\tan^{-1} x$ (3+2)

(c) If $ax^2 + by^2 + 2gx + 2fy + c = 0$, find $\frac{dy}{dx}$ 5

UNIT — IV

IX (a) Find the equation to the tangent and normal to the curve $y = x^2 + 2x - 3$at (2,5). 5

(b) A circular plate of radius 3 inches expands when heated at the rate of 2 inches/second. Find the rate at which the area of the plate is increasing at the end of 3 seconds. 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 x – axis. 5

(b) A balloon is spherical in shape. Gas is escaping from it at the rate of 10 cc/sec. How fast is the surface area shrinking when the radius is 15 cm ? 5

(c) The perimeter of a rectangle is 100 m. Find the sides when the area is maximum. 5