FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING / TECHNOLOGY — OCTOBER, 2015

ENGINEERING MATHEMATICS – I

(Common for all branches 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 $3sin30 - 4cos^3 60$.
2. If $tanx = 0.38$, find the value of $tan2x$ without using table.
3. In ΔABC, $a = 12$cm, $b = 13$cm, $c = 60°$ find C.
4. Evaluate $\lim_{x \to 0} \frac{cx + d}{ax + b}$.
5. Find the rate of change of area of a circle with respect to its radius. (5x2=10)

PART— B

(Maximum marks : 30)

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

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

   (b) If $cos\theta = \frac{1}{2}$, θ lies in first quadrant, find $3sin\theta - 4tan\theta$.
2. Find the value of $tan75$ without using tables and show that $tan75 + cot75 = 4$.
3. Show that $sin10sin50sin70 = \frac{1}{8}$.
4. Differentiate x^n with respect to x by the method of first principles.
5. If $y = x + \frac{1}{x}$, prove that $x^2y'' + xy' = y$.
6. The displacement of a body is given by $x = 3cos4t + 5sin4t$. Show that acceleration varies as the distance.
7. A cylindrical can open at one end is to have a volume of 64π cm^3. Find the radius and height of the cylinder such that the metal used is minimum. (5x6=30)

PART— C

(Maximum marks : 60)

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

UNIT – I

III (a) Evaluate $sin780cos390 + sin(-300)cos330$. 5

(b) An aeroplane starts from a place and flies 1000m along a straight line at 45° to the horizontal. Find the horizontal distance described. 4

(c) If $cosA = \frac{3}{5}$, $tan\ B = \frac{5}{12}$, A and B are acute angles find $sin\ (A+B)$ and $cos\ (A+B)$. 6

OR

IV (a) Express $\sqrt{3}cosx + sinx$ in the form $Rsin(x+\alpha)$. 5

(b) Evaluate $sin^3\frac{\pi}{3}\ cos^2\frac{\pi}{4}\ tan\frac{\pi}{6}$. 4

(c) Prove that $\frac{1+sinA}{cosA} = \frac{cosA}{1-sinA}$ 3

(d) If $\theta = 45°$, verify that $cos2\theta = cos^2\theta - sin^2\theta$. 3

UNIT – II

V (a) Find the value of $cos\frac{A}{2}$ and $sin\frac{A}{2}$. Given $sinA = 0.75$ 5

(b) Prove that $sin50 - sin70 + cos80 = 0$. 5

(c) Solve ΔABC, given $a = 87cm$, $b = 53cm$, $c = 70°$. 5

OR

VI (a) Prove that $\frac{sinA + sin3A + sin5A}{cosA + cos3A + cos5A} = tan3A$. 5

(b) Show that $a\ (b^2 + c^2)\ cosA + b(c^2 + a^2)cosB + c(a^2 + b^2)cosC = 3abc$. 4

(c) Find the area of a triangle having $a = 4cm$, $b = 5cm$, $c = 7cm$. 3

(d) In ΔABC, $A = 45°$, $B = 60°$, $a = 5cm$, find b. 3

UNIT – III

VII (a) Evaluate :

(i) $\lim_{x\to 3}\frac{x^3 - 27}{x^4 - 81}$ (ii) $\lim_{\theta\to\frac{\pi}{2}}\frac{cos\theta}{\frac{\pi}{2} - \theta}$ (4+4=8)

(b) Find $\frac{dy}{dx}$, if $xy = c$. 3

(c) Find $\frac{dy}{dx}$, if $x = a(\theta - sin\theta)$ and $y = asin\theta$. 4

OR

Marks

VIII (a) Find $\frac{dy}{dx}$, if :

(i) $y = \frac{sin2x}{x}$ (ii) $y = x^2 cosx^2$ (3+3=6)

(b) If $y = asinmx$, prove that $y'' = m^2y = 0$. 5

(c) If $x^3 + y^3 = 3axy$, find $\frac{dy}{dx}$ 4

UNIT – IV

IX (a) Find the equations of tangent and normal to the curve $y = 3x^2 + x + 2$ at (1, 2). 5

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

(c) A balloon is spherical in shape. Gas is escaping from it at the rate of 10cc/second. Find the rate at which its radius is shrinking when the radius is 15 cm. 5

OR

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

(b) An open box is to be out of a square sheet of side 12cm by cutting off equal squares at each corner and turning up the sides. What size of the square sheet should be cut in order that the volume of the box may be maximum. 5

(c) If S denotes the displacement of a particle at time t second and $S = 2t^3 - 9t^2 + 12t + 6$ find the value of 't' when the acceleration is zero. Find the velocity at that time. 5