

Total No. of Questions :8]

SEAT No. :

P4028

[Total No. of Pages :3

[5351] - 108

F.Y.

ENGINEERING

Engineering Mathematics - II

(2015 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figure to the right indicates full marks.*
- 4) *“Assume suitable data, if necessary and clearly state.”*
- 5) *Use of electronic pocket calculator is allowed.*

Q1) a) Solve the following.

i) Solve the following differential equation $(4 + e^{2x}) \frac{dy}{dx} = ye^{2x}$. [4]

ii) Solve, $x(x - y) \frac{dy}{dx} = y(x + y)$. [4]

- b) A steam pipe 40cm in diameter contains steam at 150°C and is protected with a covering 10cm. thick for which $k=0.0012$, If the temperature of the outer surface of the covering is 30°C, find the temperature at a distance 25cm from the center of the pipe under steady-state condition. [4]

OR

Q2) a) Solve $\cos x \frac{dy}{dx} + y = \sin x$. [4]

- b) i) A body at temperature 100°C is placed in a room whose temperature is 25°C and cools to 80°C in 10 minutes. Find the time when the temperature will be 60°C. [4]

- ii) a resistance of 150 ohms and an inductance of 0.3 H are connected in series with a battery of 25 volts. Find the current in the circuit if $i=0$ at $t=0$. [4]

P.T.O.

Q3) a) Obtain Fourier series expansion for $f(x) = x^2$ in the interval $-1 < x < 1$,
 $f(x+2l) = f(x), \forall x$. [5]

b) Evaluate $\int_0^{\infty} x^7 e^{-2x^2} dx$. [3]

c) Solve any one.

i) Trace the curve $r = a \cos 2\theta$ [4]

ii) Trace the curve $xy^2 = a^2(a-x)$ [4]

OR

Q4) a) If $u_n = \int_0^{\pi/4} \tan^n \theta d\theta$ then show that $n(U_{n+1} + U_{n-1}) = 1$. [4]

b) If $f(x) = \int_a^x (x-t)^2 G(t) dt$, then. [5]

show that $\frac{d^3 f}{dx^3} - 2G(x) = 0$.

c) Find the perimeter of the cardioid $r = a(1 + \cos \theta)$ from $\theta = 0$ to $\theta = \frac{\pi}{3}$. [4]

Q5) a) Find the equation of the sphere for which the circle $x^2 + y^2 + z^2 + 7y - 2z + 2 = 0, 2x + 3y + 4z = 8$ is a great circle. [5]

b) Find the equation of right circular cone whose vertex is $(1,1,1)$, axis the

line $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-1}{3}$ and semi vertical angle $\frac{\pi}{4}$. [4]

c) Find the equation of a right circular cylinder having its radius as 03 units

and equation of whose axis is $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-2}{3}$. [4]

OR

- Q6)** a) Find the sphere through the circle $x^2 + y^2 + z^2 = 4, z = 0$ meeting the plane $x + 2y + 2z = 0$ in a circle of radius 3. [5]
- b) Find the equation of the right circular cone with vertex $(-1, 0, 0)$, semi vertical angle 60° and axis is x -axis. [4]
- c) Find the equation of a right circular cylinder having its radius as 04 units and equation of whose axis is $\frac{x+1}{1} = \frac{y+1}{-1} = \frac{z+1}{1}$. [4]

Q7) Attempt any two of following

- a) Change the order of integration $\int_0^a \int_{-y^2}^{y^2} f(x, y) dx dy$? [7]
- b) Find the volume of tetrahedron bounded by the co-ordinate planes and the plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 1$? [6]
- c) Find moment of inertia of the portion of the parabola $y^2 = 4ax$, bounded by x -axis and latus rectum, about x -axis, if density at each point varies as the cube of the abscissa? [6]

OR

Q8) Attempt any two of following

- a) Evaluate $\iint_R x^2 y^2 dx dy$ over the positive quadrant of $x^2 + y^2 = 1$? [7]
- b) Evaluate $\iiint \frac{dx dy dz}{\sqrt{1-x^2-y^2-z^2}}$ taken throughout the volume of the sphere $x^2 + y^2 + z^2 = 1$ in positive octant? [6]
- c) ABCD is a square plate of side a and O is the mid point of AB. If the surface density varies as the square of distance from O , show that the center of gravity of the plate is at a distance $\frac{7a}{10}$ from O ? [6]

