Total No. of Questions :8]

SEAT No. : ____

P4028

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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 $\left(4+e^{2x}\right)\frac{dy}{dx}=ye^{2x}$. **[4]**

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

b) A steam pipe 40cm in diameter contains steam at 150^0C and is protected with a covering 10cm. thick for which k=0.0012, If the temperature of the outer surface of the covering is 30^0C, 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 100^0C is placed in a room whose temperature is 25^0C and cools to 80^0C in 10 minutes. Find the time when the temperature will be 60^0C. **[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 $f(x)=\int_a^x (x-t)^2 G(t)$ at, then. **[5]**

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

c) Find the primeter of the cordioide $r=a(1+\cos\theta)$ 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 of the cone with vertex (-1,0,0), semi vertical angle 60^0 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 $\int_0^a \frac{\int^{y+a}}{a^2-y^2} f(x,y)\,dxdy$? **[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 $\iint_R x^2y^2dxdy$ over the positive quadrant of $x^2+y^2=1$? **[7]**

b) Evaluate $\iiint \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$ 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 0 is the mid point of AB. If the surface density various as the square of distance from 0, show that the center of gravity of the plate is at a distance $\frac{7a}{10}$ form 0? **[6]**