UNIVERSITY OF PUNE
[4361-108]
F.E. Examination 2013
Engineering Mathematics -II
(2012 pattern)

Time-Two hours **Maximum Marks-50**
[Total No. of Question=8] **[Total no. of printed pages= 3]**
Instructions:

(1)Attempt 4 questions :Q.1 or Q.2,Q.3 or Q.4,Q.5 or Q.6,Q.7 or Q.8.
(2)Neat diagrams must be drawn whereever necessary.
(3)Figures to the right indicate full marks.
(4)Use of electronic non-programmable calculator is allowed.
(5)Assume suitable data whenever necessary.

SECTION-I

Q.1 (a)Solve the following differential equations. (8)

(i) $(x^4 e^x - 2\text{mxy}^2)\,dx + 2\text{mx}^2 y\,dy = 0$

(ii) $\left(\tan\frac{y}{x} - \frac{y}{x} sec^2\frac{y}{x}\right)dx + sec^2\frac{y}{x}\,dy = 0$

(b)A constant electromotive force E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. If the initial current is zero, show that the current builds up to half its theoretical maximum in $\frac{L\log 2}{R}$ seconds. (4)

OR

Q.2 (a)Solve $[\log(x^2+y^2) + \frac{2\text{x}^2}{x^2+y^2}]dx + \frac{2\text{xy}}{x^2+y^2}dy = 0$. (4)

(b) Solve the following:- (8)

(1)A particle is moving in a straight line with an acceleration $k\left[x+\frac{a^4}{x^3}\right]$ directed towards origin. If it starts from rest at a distance 'a' from the origin, prove that it will arrive at origin at the end of time $\frac{\pi}{4\sqrt{k}}$.

(2)A pipe 10cm in diameter contains steam at $100^0 C$. It is covered with asbestos,5cm thick,for which k=0.0006 and the outside surface is at $30^0 C$ .Find the amount of heat lost per hour from a meter long pipe.

Q.3 (a)Express $f(x)=\pi^2-x^2, -\pi\leq x\leq\pi$ as a fourier series, where $f(x)=f(x+2\pi)$. (5)

(b)Evaluate $\int_0^\infty \frac{x^8-x^{14}}{(1+x)^{24}}dx$. (3)

(c)Trace the curve (Any one) (4)

(i) $y^2=x^2(1-x)$

(ii) $r=2\sin 3\theta$

OR

Q.4 (a)show that the length of an arc of the curve $x=\log(sec\theta+\tan\theta)-\sin\theta$, $y=\cos\theta$ from $\theta=0$ to $\theta=t$ is log(sec t). (4)

(b)Evaluate: $\int_0^\pi x\sin^5 x\cos^2 x\, dx$. (4)

(c)Evaluate $\int_0^1 \left[\frac{x^m-1}{logx}\right]dx$. (4)

Q.5 (a)Find the equation of the sphere, having its center on the plane 4x – 5y – z = 3 and passing through the circle. $x^2+y^2+z^2-2x-3y+4z+8=0, x-2y+z=8$. (5)

(b)Find the equation of a right circular cone, having vertex at the point (0,0,3)and passing through the circle $x^2+y^2=16$,z=0. (4)

(c) Find the equation of a right circular cylinder of radius 2,whose axis passes through the point (1,1,-2) and has direction cosines proportional to 2,1,2. (4)

OR

Q.6 (a) Find the equation of the sphere which is tangential to the plane $4x - 3y + 6z - 35 = 0$ at (2,-1,4) and passing through the point (2,-1,-2). (5)

(b) Find the equation of a right circular cone with vertex at origin,the line $x = y = 2z$ as the axis and semi-vertical angle 30^0 . (4)

(c) Find the equation of a right circular cylinder whose axis is

$2(x-1) = y+2 = z$ and radius is 4. (4)

Q.7 Solve any two:

(a)Evaluate $\int_0^a \int_{y^2/a}^{y} \frac{y\,dx\,dy}{(a-x)\sqrt{ax-y^2}}$ (7)

(b)Evaluate $\iiint_V \sqrt{x^2+y^2}\,dx\,dy\,dz$,where V is bounded by the surface

$x^2+y^2=z^2$,$z \geq 0$ and the plane $z=1$. (6)

(c) Find the Moment of Inertia (M.I) about the line $\theta=\frac{\pi}{2}$ of the area enclosed by the curve $r=a(1+\cos\theta)$. (6)

OR

Q.8 Solve any two:

(a)Find by double integration the area between the curve $y^2 x=4a^2(2a-x)$ and its asymptote. (7)

(b)Find the volume of the cylinder $x^2+y^2=2ax$ intercepted between the paraboloid $x^2+y^2=2az$ and xoy - plane. (6)

(c)Find the centre of gravity (C.G.)of one loop of the curve $r=a\sin 2\theta$. (6)