Sample Question Paper – I

9030

Course Name   :- Electronics Group
Course code   :- EE/EP/ET/EN/EX/IE/IS/IC/DE/EV/MU/ED/EI
Semester   :- Third
Subject   :- Applied Mathematics
Duration   :- 3 hours   Marks: 80

Instructions: 1) All the questions are compulsory
                2) Figures to the right indicate full marks
                3) Assume suitable additional data if necessary
                4) Use of pocket calculator is permissible

Q. 1 Attempt any eight of the following   (16)

    a)   Integrate w.r.t. x

$$\frac{1}{1+x^2}+e^{5x}$$

    b)   Integrate w.r.t. x

$$\left(x+\frac{1}{x}\right)^2$$

    c)   Integrate w.r.t. x

$$xe^x$$

    d)   Evaluate $\int_0^2 \frac{5x}{x^2+4}dx$

    e)   Find the order and degree of the differential equation

$$\frac{d^2x}{dt2}+\left(\frac{dx}{dt}\right)^2=5$$

    f)   Solve the differential equation

$$x\frac{dy}{dx}-y=0$$

    g)   Find the equation of the curve whose slope is (x-3) and which passes through (2,0)

    h)   Find $L\left(2+3t-e^{-t}\right)$

    i)   Find $L\left(t^2e^{3t}\right)$

i)   Find $L^{-1}\left(\dfrac{6}{25-3}\right)$

Q. 2   Attempt any three   **(12)**

a)   Form the differential equation if
$y = Ae^{3x} + Be^{-3x}$

b)   Solve the differential equation
$\dfrac{dy}{dx} = \dfrac{x^2 + y^2}{2xy}$

c)   Solve
$x\log x\dfrac{dy}{dx} + y = 2\log x$

d)   A particle starting with velocity 6m/sec has an acceleration $\left(1-t^2\right)m/\sec^2$. When does it first come to rest? How far has it then traveled?

Q.3   Attempt any three   **(12)**

a)   Find $L[\sin 4t \cos 2t]$

b)   Find $L\left[e^{-2t}\left(3\cos 4t - 2\sin 3t\right)\right]$

c)   Find $L^{-1}\left[\dfrac{s+1}{s^2 + s + 1}\right]$

d)   Solve by using L.T.
$3\dfrac{dx}{dt} + 2x = e^{3t}$ if $x(0) = 1$

Q. 4   Attempt any four   **(16)**

a)   Integrate w.r.t. x
$\dfrac{\left(Sin^{-1}x\right)^3}{\sqrt{1-x^2}}$

b)   Integrate w.r.t. x
$\dfrac{1}{(x+1)(x+2)(x+3)}$

c)   Evaluate $\displaystyle\int_1^3 \dfrac{dx}{\sqrt{x^2 - 6x + 13}}$

d)   Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{\sqrt{\cos x}}{\sqrt{\cos x}\sqrt{\sin x}}dx$

e) Find the area of circle $x^2 + y^2 = r^2$ by integration

f) Find R.M.S. value of an alternating current I = 10 sin 100 π t

Q. 5   Attempt any three   (12)

a) Obtain Fourier series for
f(x) = x in the internal $(-\pi, \pi)$

b) Using Bisection method find the approximate root of the equation
$x^3 - x - 4 = 0$ (carry out three iterations only)

c) Find a root of the equation
$x^3 - 2x - 5 = 0$ using regular falsi method (up to 3 iterations)

d) Using Newton Raphson method to evaluate
$\sqrt{10}$ correct to three decimal places

Q. 6   Attempt any three   (12)

a) Obtain the half range cosine series for f(x) = x over $(0, \pi)$

b) Solve the following equations by Gauss Elimination method
$2x + 3y + z = 13, x + y - 2z = -1, 3x - 4y + 4z = 15$

c) Solve the following equation by Jacobi's method
$10x + y + 2z = 13, 3x + 10y + z = 14, 2x + 3y + 10z = 15$

d) Solve the following equations by Gauss – Seidal method
$6x + y + z = 105, 4x + 8y + 3z = 155, 5x + 4y - 10z = 65$