SCHEME – E

Sample Question Paper – I

Course Name :- Electronics Group

Course code :- EE/EP/ET/EN/EX/IE/IS/IC/DE/EV/MU/ED/EI

Semester :- Third **12054**

Subject :- Applied Mathematics

Time :- 3 hours **Marks: 100**

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 TEN of the following: **20 Marks**

a) Evaluate
$$\frac{1}{1+x^2}+e^{5x}\ dx$$

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

c) Evaluate
$$xe^{x}\ dx$$

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

j) Find $L^{-1}\left(\frac{6}{2s-3}\right)$

k) $\int \frac{dx}{(x+1)(x+2)}$

l) Verify that y= e^{-x} is a solution of $\frac{d^2y}{dx^2} - y = 0$

Q.2 Attempt any FOUR of the following: **16 Marks**

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

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

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

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?

e) Solve (2x+3cosy) dx +(2y-3xsiny) dy=0

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

Q.3 Attempt any FOUR of the following: **16 Marks**

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

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

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

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

e) State and apply convolution theorem $L^{-1}\left[\frac{1}{s(s-1)}\right]$

f) Find L(Cos³ 2t)

Q.4 Attempt any FOUR of the following: **16 Marks**

a) Evaluate
$$\frac{\left(Sin^{-1}x\right)^3}{\sqrt{1-x^2}}$$

b) Evaluate
$$\frac{1}{(x+1)(x+2)(x+3)}\ dx$$

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

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

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 FOUR of the following: **16 Marks**

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

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

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

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

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

Q. 6 a) Attempt any ONE of the following: **08 Marks**

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

b) Obtain Fourier series for

f(x) = x - x^2 in the internal (1, -1)

b) Attempt any TWO of the following: 08 Marks

a) Evaluate $\int x \tan^{-1} x dx$

b) Evaluate $\int \frac{\cos x}{(1+\sin x)(2+\sin x)} dx$

c) Find mean value of an alternating current I = asint over (0, π)