SCHEME – E

Sample Question Paper

Course Name : Computer Engineering Group

Course Code : CO/CM/IF/CD

Semester : Third **12062**

Subject : Applied Mathematics

Duration : 3 Hours **Max Marks : 100**

Instructions:

- All Questions are compulsory.
- Figures to the right indicate full marks.
- Assume suitable data if necessary.

Q1. Attempt Any TEN of the following: **20 Marks**

a) Evaluate $\int \frac{1}{1+\cos x} dx$

b) Evaluate $\int \frac{\sin x + \cos x}{\sin x - \cos x} dx$

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

d) Evaluate $\int \sin^2 x \cos x dx$

e) Evaluate $\int_{-1}^{1} \frac{1}{1+x^2} dx$

f) Show that $(x^4-2xy^2+y^4)dx + (\sin y - 2x^2y + 4xy^3)dy = 0$ is an exact

g) Show that $\Delta \log f(x) = \log[1 + \frac{\Delta f(x)}{f(x)}]$

h) Given $U_4=0$ $U_5=3$ $U_6=9$ the second difference being constant find U_2

i) By using Trapezoidal Rule evaluate $\int_{-3}^{3} x^4 dx$ with h=1

j) If A={1,2,3,4} B={2,4,6,8}
Find i) A ∪ B ii) A ∩ B

k) Evaluate $\int xe^x dx$

l) Find the order and degree of differential equation
$k\frac{d^2y}{dx^2} = [1 + \frac{dy}{dx}]^{3/2}$.

Q2. Attempt Any FOUR of the following: 16 Marks

a) Form the differential Equation whose solution is $y=e^{m\cos^{-1}}(x)$

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

c) Solve $\frac{dy}{dx}=\frac{y}{x}+\tan(\frac{y}{x})$

d) Solve $\cos^2 x\ \frac{dy}{dx}+y=\tan x$

e) Solve $\frac{dy}{dx}+xy=x^3y^3$

f) The current in the circuit is given by $I=\frac{dq}{dt}=20\ e^{-5t}$ calculate the amount of charge q transferred between t =0 & t=0.1 sec

Q3. Attempt any FOUR of the following: 16 Marks

a) Using Lagrange's interpolation formula evaluate f(10) from the following data

x	5	6	9	11
y	12	13	14	16

b) Estimate the value of f(22) from the following available data[Using Newton's forward interpolation formula]

x	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

c) Find f(4.5) from the following data

x	1	2	3	4	5
f(x)	2.38	3.65	5.85	9.95	14.85

d) A circuit consists of resistance R and a condenser of capacity 'C' farads connected to a constant E.M.F 'E'. If the differential equation of the circuit is given by $\frac{q}{c}=E-\frac{Rdq}{dt}$ .Find q given that q=0 when t=0.

e) Find 12^3 using extrapolation

x	2	5	8	11
y	8	125	512	1331

f) From the following table find the number of students who obtained marks more than 65[Use Newton's backward interpolation formula]

Marks obtained	30-40	40-50	50-60	60-70	70-80
No. of Students	30	41	52	36	31

Q4. Attempt any FOUR of the following: **16 Marks**

a) Evaluate $\int \frac{e^x(x+1)}{\cos^2(xe^x)}dx$

b) Evaluate $\int \frac{\log(\log x)}{x}dx$

c) Evaluate $\int_0^1 \sin^{-1} x dx$

d) Evaluate $\int_0^{\Pi} \frac{x}{1+\sin x}dx$

e) Using integration find the area of the circle $x^2+y^2=a^2$

f) Using integration find the area bounded by two parabolas $y^2=4ax$ and $x^2=4ay$

Q5. Attempt any FOUR of the following: **16 Marks**

a) Given the following values of a function at equal intervals.

x	0.1	0.2	0.3	0.4
f(x)	1.10517	1.22140	1.34986	1.49182

Find f '(x) at x=0.4.

b)Using table

x	0	$\pi/8$	$\pi/4$
tan x	0	0.4141	1.0

Find $\int_0^{\Pi/4} \tan x dx$ by trapezoidal Rule. Here obtain $\log_e 2$ approximately.

c) Use Simpson's 1/3rd Rule to evaluate

$\int_{-3}^{3} x^4 dx$ by taking 7 equidistant ordinates.

d)Use Range-Kutta fourth order method to Find the value of y when x=1.Given that

$\frac{dy}{dx} = \frac{y-x}{y+x}$ and y(0)=1

e) A curve is drawn to pass through the points given by the following table

x	1	1.5	2	2.5	3	3.5
y	2	2.4	2.7	2.8	3	2.6

Using Simpson's 1/3rd rule estimate the area bounded by the curve y=f(x), the x-axis and x=1

f) Using second order Runge-Kutta method solve differential equation

$y' = -y$, y(0)=1 for x_1=0.2 and x_2=0.4

Q6. Attempt any FOUR of the following: Marks-16

a) Using Runge-Kutta method of Fourth order Solve the equation $\frac{dy}{dx}$ =3x+$\frac{y}{2}$

with y(0)=1 for y(0.1) taking h=0.1

b) If A={1,3,5,7,9} B={2,4,6,8,10} and C={3,4,7,8,11,12}

Verify

i) A ∩ (B U C)=(A ∩ B) U(A ∩ C)

ii) A-(B U C)=(A-B) ∩ (A-C)

c) If A and B are two finite sets then use Venn Diagram to show

i) (A ∩ B)' = A' U B'

ii) (A U B) ' = A' ∩ B'

d) Find how many integers from 1 to 300 are not divisible by 3 nor by 5.

e) Evaluate $\int_0^4 \frac{\sqrt{x+5}}{\sqrt{x+5}+\sqrt{9-x}} dx$

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