

Sample Question Paper – I

9035

Course Name :- Computer Group
 Course code :- CO/CM/IF/CD
 Semester :- Third
 Subject :- Applied Mathematics
 Duration :- 3 hours

Marks: 80

Instructions:

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

Q1. Attempt Any Eight

Marks-16

- a) Evaluate $\int \frac{1}{\sqrt{x} - \sqrt{x-1}} dx$
- b) Evaluate $\int e^{\sin x} \cos x dx$
- c) Evaluate $\int xe^x dx$
- d) Evaluate $\int \frac{2x+3}{x^2+3x+1} dx$
- e) Evaluate $\int_0^{\pi/2} \sin^2 x dx$
- f) Find the order and degree of differential equation
 $k \frac{d^2y}{dx^2} = [1 + \frac{dy}{dx}]^{3/2}$.
- g) Prove that $E \nabla = \nabla E = \Delta$
- h) Show that the second differences of the polynomial $y=x^2$ when $x=1,3,5,7,9$, are constant.
- i) By using Simpson's 1/3rd Rule Evaluate $\int_1^5 f(x) dx$ using following table.
- | | | | | | |
|------|----|----|----|----|-----|
| x | 1 | 2 | 3 | 4 | 5 |
| f(x) | 10 | 50 | 70 | 80 | 100 |
- j) If $X=\{1,2,3,4,5,6,\dots,15\}$
 $A= \{5,6,7,8,9,10,11\}$
 $B= \{9,10,11,12,13,14\}$
 Find $A' - B'$

Q2. Attempt Any Three

Marks-12

- a) Verify that $y=\log x$ is a solution of differential equation

$$x \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$$

- b) Solve $\frac{dy}{dx} = \cos(x + y)$
 c) Solve $(2x+3\cos y) dx + (2y-3x\sin y) dy=0$
 d) Solve $x \log x \frac{dy}{dx} + y = 2 \log x$

Q3. Attempt any Three

Marks-12

a) Given

x	3	7	9	10
y	168	120	72	63

Estimate y when x=6 Using Lagrange's interpolation formula

b) Using Newton's forward formula for interpolation find f(1.5) from the following data

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

c) 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

d) The current I flowing in the circuit containing resistance R and inductance L in series with voltage source E at time t is given by $L \frac{dI}{dt} + RI = E$. Show that

$$I = \frac{E}{R} (1 - e^{-Rt/L})$$

Q4. Attempt any four

Marks-16

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

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

c) Evaluate $\int_0^{\pi/2} \frac{\sin x}{(1 + \cos x)^3} dx$

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

e) Using integration find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

f) Find the area between parabola $y=x^2$ and the line $y=x$

Q5. Attempt Any Three

Marks-12

- a) Find $y'(0)$ from the following data

x	0	1	2	3	4	5
y	4	8	15	7	6	2

- b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Trapezoidal Rule by taking $h=4$ and hence obtain approximate value of π

- c) 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 $x=1$

- d) By Using Range-Kutta method fourth order solve the differential equation

$$\frac{dy}{dx} = \frac{y}{x}, y(1)=1 \text{ obtain } y \text{ when } x=1.1 \text{ (Take } h=0.1)$$

Q6. Attempt any Three

Marks-12

- a) Using second order Runge-Kutta method solve differential equation $y' = -y, y(0)=1$ for $x_1=0.2$ and $x_2=0.4$

- b) Using Runge-Kutta method of Fourth order to find an approximate value of y when $x=0.02$ given that $\frac{dy}{dx} = x^2 + y^2$ with $y(0)=1$

- c) If $A = \{x/x^2 - 11x + 28 = 0\}$ $B = \{x/x^2 + 8x - 48 = 0\}$ and $C = \{x/x^2 + 12x + 35 = 0\}$ And the universal set $X = \{-12, -10, -7, -6, -5, 4, 5, 7\}$ Verify that

- i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
- ii) $(A \cup C)' = A' \cap C'$

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