

4. Match List I with List II with suitable codes given.

CO2 [K₁]

List I	List II
A. $y = ax + b$	1. parabolic fit
B. $y = ax^2 + bx + c$	2. polynomial fit
C. $y = ae^{bx}$	3. straight line fit
D. $y = ax^b$	4. exponential fit

- a) A-3,B-4,C-2,D-1 b) A-3,B-1,C-4,D-2
 c) A-4,B-3,C-1,D-2 d) A-4,B-3,C-2,D-1

5. To evaluate $\int_a^b f(x)dx$ using Simpson's 3/8 rule, the number of intervals can be

CO3 [K₁]

- a) 4 b) 10
 c) 5 d) 6

6. If $f(x) = \frac{1}{x}$ then $f(a, b)$ is

CO2 [K₃]

- a) $\frac{1}{ab}$ b) $\frac{1}{abcd}$
 c) $\frac{ab}{b-a}$ d) $-\frac{1}{ab}$

7. Examine the two statements carefully and select the answer using the codes given below:

CO5 [K₄]

Assertion (A): The PDE $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ is elliptic.

Reason (R): A PDE $Au_{xx} + Bu_{xy} + Cu_{yy} = 0$ is elliptic, if $B^2 - 4AC = 0$.

- a) Both A and R are individually true and R is the correct explanation of A. b) Both A and R individually true and R is not the correct explanation of A.
 c) A is false and R is true d) A is true and R is false

8. Residual method is also called as

CO4 [K₁]

- a) Shooting method b) polynomial method
 c) Collocation method d) Finite difference method

9. Which of the following statements are true?

CO2 [K₁]

- 1) Bezier surfaces are defined by the control points similar to interpolation.
- 2) To draw Bezier surfaces two orthogonal Bezier curves are required.
- 3) The Bezier surfaces must lie in the convex hull of the polygon.
- 4) Each boundary of Bezier surfaces are Bezier surfaces.

- a) 1,2,3 b) 2,3,4
 c) 1,4 d) 1,3

10. In the finite difference method of solving an ODE, what among the following is used: CO4 [K₁]
- a) $y'' = \frac{y_{i-1} + 2y_i + y_{i+1}}{h^2}$ b) $y'' = \frac{y_{i-1} + 2y_i + y_{i+1}}{h^4}$
- c) $y'' = \frac{y_{i-1} - 2y_i + y_{i+1}}{h^4}$ d) $y'' = \frac{y_{i-1} - 2y_i + y_{i+1}}{h^2}$

PART B (10 x 2 = 20 Marks)

11. Write the secant method formula to solve the transcendental equation $f(x)=0$. CO1 [K₂]
12. Determine the error estimate in Muller's method when x_0 and x_r are 5 and 3.9765 respectively. CO1 [K₃]
13. Write down the normal equations to fit the parabola $y = ax^2 + bx + c$ CO2 [K₂]
14. Test whether $P_1(x) = x^2 - x + 1, 1 \leq x \leq 2, P_2(x) = 3x - 3, 2 \leq x \leq 3$, are Cubic Spline functions. CO2 [K₄]
15. Derive the polynomial for the data given below using Newton's divided difference formula. CO3 [K₃]

x	1	3	6
y	3	7	10

16. Dividing the range into 10 equal parts, find the approximate value of $\int_0^\pi \sin x dx$ by trapezoidal rule. CO3 [K₂]
17. Split the BVP $y'' = -xy' + y + 2x + \frac{2}{x}, y(1) = 0, y(2) = 4 \ln 2$, take $h=0.2$ into two IVP's using linear shooting method. CO4 [K₄]
18. What is collocation method and write any two-basis function which are used in Collocation method. CO4 [K₂]
19. Classify the PDE $u_{xx} + u_{yy} + u_{xy} = 0$ CO5 [K₄]
20. To solve the parabolic equation $u_{xx} = au_{tt}, u(0,t) = T_0, u(l,t) = T_1$ with initial condition $u(x,0) = f(x)$ using finite difference quotients, write the formula to evaluate one dimensional heat equation by Crank Nicholson method. CO5 [K₄]

PART C (6 x 5 = 30 Marks)

21. Determine the positive root of the following equation $f(x) = 2x^3 + 3x - 6$ by using Newton's method. 5 CO1 [K₃]
22. Certain experimental values of x and y are given below (0,1),(1,1.8),(2,3.3), (3,4.5),(4,6.3). If the straight line is fitted to above data find the value of a and b 5 CO2 [K₄]
23. Find P(t) for Bezier curve which has control points (1,1), (3,0),(5,-1),(7,-2). 5 CO2 [K₄]
24. A river is 80 m wide, the depth 'd' in meters distance 'x' m from one bank is given by the following table. Calculate the area of cross section of the river using Simpsons rule. 5 CO3 [K₅]

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

25. Solve the boundary value problem $y''(x) = y(x)$, $y(0) = 0$, $y(1) = 1.1752$ by Taylor's series method. 5 CO4 [K4]
26. Solve the one dimensional heat equation $u_{xx} = u_t$ with the boundary and initial values $u(0,t) = 0$, $u(4,t) = 0$, $u(x,0) = x(4 - x)$. Assume $h = k = 1$ upto $t = 5$ by using Bender Schmidt explicit formula. 5 CO5 [K3]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Solve for x and y the equations $f(x, y) = x^2 + y - 11 = 0$, $g(x, y) = y^2 + x - 7 = 0$, assuming the initial approximations $x_0 = 3.5$, $y_0 = -1.5$ by using Newton Raphson method. 10 CO1 [K3]

28. Find $y(2.5)$ using the cubic Spline approximation for the function given that $M_0 = M_3 = 0$ 10 CO2 [K3]

x	0	1	2	3
y=f(x)	1	2	33	244

29. a) Evaluate $\int_0^1 \int_0^1 e^{x+y} dx dy$ using Trapezoidal and Simpson's rules with $h = 0.5 = k$ 5 CO3 [K3]

b) Evaluate y' and y'' at $x = 2$ given

x	0	1	3	6
y	18	10	-18	40

Using Newton's divided difference formula.

30. Solve the ODE $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$ with the boundary values $y(0) = 2$, $y(1) = 10.1$ with $h = 0.5$ by using finite difference method. 10 CO4 [K4]

31. Evaluate $u_{tt} = 16u_{xx}$, $0 \leq x \leq 1$, $t \geq 0$, $u_t(x,0) = 0$ given, $u(0,t) = 0$, $u(5,t) = 0$, $u(x,0) = x^2(5 - x)$ taking $h = 1$ and upto one half of the period of oscillation 10 CO5 [K5]
