Name :
Reg No :

B

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

07 THRISSUR CLUSTER

THIRD SEMESTER M.TECH. DEGREE EXAMINATION DEC 2017

Department

Specialisation

07CE7409 NUMERICAL METHODS

Time : 3 hours **Max.Marks: 60**

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no.	Module 1	Marks
1a	Using iteration method, find the positive root of the equation $2x - log_{10}x - 7 = 0$ correct to four decimal places.	4
	Answer b or c	
b	Using Newton Raphson method find the smallest positive root of the equation correct to four decimal places: $xe^x - Cosx = 0$	5
c	Using Regula Falsi method, find the root of the equation between 2.5 and 3 correct to four decimal places $x.tanx + 1 = 0$	5

Q.no.	Module 2	Marks
2a	Find the largest Eigen value and corresponding Eigen vector of the matrix by power method $\begin{bmatrix} 2 & 2 & -7 \\ 2 & 1 & 2 \\ 0 & 1 & -3 \end{bmatrix}$	4
	Answer b or c	
b	Using Gauss elimination method, Solve the equations $5x - 2y + 4z = 5$ $-2x + y + z = 1$ $4x + y + 2z = 6$	5
c	Apply Gauss-Seidel iteration method to solve $5x - y + z = 10$ $2x - y + z = 10$ $x + y + 5z = -1$	5

Q.no. **Module 3** **Marks**

3a Obtain Newton's divided difference interpolating polynomial satisfying the following values. Also find ***f(4.5)*** **4**

x	1	3	4	5	7	10
y	3	31	69	131	351	1011

Answer b or c

b Fit a cubic spline curve for the points. Given that *y''(0)= y''(3)=0* **5**

x_i	1	2	3	4
y_i	1	5	11	8

c Obtain Lagrange's interpolating polynomial satisfying the following values. Also find ***f(2.5).*** **5**

x	0	1	3	4
y	-12	0	6	12

Q.no. **Module 4** **Marks**

4a How is the value of c found in the relation $y = ax^b + c$ before reducing it to the linear form? **4**

Answer b or c

b Fit a curve of the form $\boldsymbol{y = ab^x}$ to the following data by the method of least squares. Find the standard error of estimate. **5**

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

c Use the multiple linear regression model to obtain a relationship for z in terms of x and y. What is the standard error of estimate? **5**

x	5	6	7	8	9	10
y	3	7	5	3	4	1
z	28	50	40	35	40	25

Q.no. **Module 5** **Marks**

5a Derive Newton's cote formula and deduce Simpson's 3/8 rule from that. **5**

Answer b or c

b Apply Simpsons 1/3 rule to evaluate the double integral $\int_0^2 \int_0^1 \boldsymbol{4xy\, dxdy}$. Take h=1/4 and k =1/2. **7**

c	Solve the equation $\mathbf{5}\boldsymbol{x}\frac{\boldsymbol{dy}}{\boldsymbol{dx}}+\boldsymbol{y}^{\mathbf{2}}-\mathbf{2}=\mathbf{0}$; y(4) =1, for y(4.1) and y(4.2) taking h=0.1 using Runge-Kutta fourth order method.	**7**

Q.no.	**Module 6**	**Marks**
6a	How partial differential equations of second order in two variables are classified? Derive the 5- point formula to solve Laplace equation.	**5**

Answer b or c

b	Solve $\frac{\boldsymbol{\partial^2 u}}{\boldsymbol{\partial x^2}}+\frac{\boldsymbol{\partial^2 u}}{\boldsymbol{\partial y^2}}=\mathbf{0}$ in *0 ≤ x ≤ 3, 0 ≤ y ≤3.*Given that *u(0,y) =0*, *u(3,y) =10+2y, u(x,0) =x^2 and u(x,3) =x^2* taking *h=k=1.*	**7**
c	The function u satisfies the equation $\frac{\boldsymbol{\partial^2 u}}{\boldsymbol{\partial t^2}}=\frac{\boldsymbol{\partial^2 u}}{\boldsymbol{\partial x^2}}$ and the conditions $u(x,0)=\frac{1}{8}sin\pi x$, $u_t(x,0)=0$ for *0 ≤ x ≤1; u(0,t)= u(1,t)=0* for *t ≥ 0.* Use explicit scheme to calculate u for x = 0 to 0.5 taking h= 0.1; t = 0 to 0.5 taking k = 0.1	**7**