

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 Newton Raphson method find the smallest positive root of the equation correct to four decimal places: $xe^x - \cos x = 0$	4

**Answer b or c**

- |   |  |   |
|---|--|---|
| b | Using iteration method, find the root of the equation $3x - \log_{10} x - 6 = 0$ between 2 and 3 correct to four decimal places. | 5 |
| c | Using Regula Falsi method, find the root of the equation between 2.5 and 3 correct to four decimal places $x. \tan x + 1 = 0$    | 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<br>$5x - 2y + 4z = 5$<br>$-2x + y + z = 1$<br>$4x + y + 2z = 6$ | 5 |
| c | Apply Jacobi's iteration method to solve<br>$5x - y + z = 10$<br>$2x - y + z = 10$<br>$x + y + 5z = -1$             | 5 |

**Q.no. Module 3 Marks**

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

<b>x</b>	1	3	4	5	7	10
<b>y</b>	3	31	69	131	351	1011

**Answer b or c**

- b** Fit a cubic spline curve for the points (2, 11), (3, 49) and (4, 123). Hence find  $y(2.5)$  and  $y'(3.5)$ . Assume that  $y''(2) = y''(4) = 0$  **5**
- c** Given the values of  $f(x)$  and  $f'(x)$ . Estimate the value of  $f(-0.5)$  and  $f(0.5)$  using Hermite's interpolation method. **5**

<b>x</b>	-1	0	1
<b>f(x)</b>	1	1	3
<b>f'(x)</b>	-5	1	7

**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  $y = ae^{-bx}$  to the following data by the method of least squares. Find the standard error of estimate. **5**

<b>x</b>	0	2	4	6	8	10
<b>y</b>	65	58	52	47	42	37

- 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**

<b>x</b>	5	6	7	8	9	10
<b>y</b>	3	7	5	3	4	1
<b>z</b>	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 Simpson's 1/3 rule to evaluate the integral. What difference does it result if we apply the rule from left end and right end. **7**

$x$	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.1
$f(x)$	0.64835	0.91360	1.16092	1.36178	1.495	1.55007	1.52882	1.44513

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

**Q.no.** **Module 6** **Marks**

- 6a Write the general form of linear partial differential equation of second order in two variables. What is the classification of partial differential equation? 5

**Answer b or c**

- b Use Crank – Nicolson’s method to solve the equation  $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ , satisfying the conditions  $u(x,0)=0$ ,  $u(0,t)=0$ ,  $u(1,t)=200t$ . Compute ‘ $u$ ’ for two time steps; taking  $h=1/4$  and  $k=1/8$ . 7
- c Solve the Laplace equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  for the following square mesh with the boundary values as shown. 7

