Q. Code: 145441

B.E./B.TECH. Degree Examination, December 2020

Fourth Semester

MA16451 Computational Methods

(Regulation 2016)

Time: Three hours Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. Given $f(0)=-1, f(1)=1$ and $f(2)=4$. The roots of the Newton's interpolating polynomial equation $f(x)=0$ are

   a) $\frac{3\pm\sqrt{17}}{2}$ b) $\frac{-3\pm\sqrt{17}}{2}$ c) $\frac{3\pm i\sqrt{17}}{2}$ d) $\frac{-3\pm i\sqrt{17}}{2}$

2. The velocity of a particle which starts from rest is given by the following table:

t (sec)	0	2	4	6	8	10	12	14	16	18	20
v (ft/sec)	0	16	29	40	46	51	32	18	8	3	0

   By Trapezoidal rule the total distance travelled in 20 sec. is

   a) 482 b) 484 c) 486 d) 488

3. Given that $\frac{dy}{dx}=x+y$ and $y=1$ when $x=0$, by Runge Kutta method, an approximate value of y when $x=0.2$ is

   a) 1.2428 b) 2.3433 c) 0.2543 d) 3.2344

4. If u satisfies Laplace equation and $u=100$ on the boundary of a square what will be the value of u at an interior grid point.

   a) 25 b) 50 c)100 d) 200

5. Form the divided difference table for the following data:

x	2	5	10
y	5	29	109

6. By evaluating $\int_0^1 \frac{dx}{1+x^2}$ by a numerical integration method, we can obtain an approximate value of ----------.

7. Given $y'=x+y, y(0)=1$ find $y(0.1)$ by Taylor's series.

8. Classify the PDE $x^2 f_{xx}+(1-y^2)f_{yy}=0, -\infty<x<\infty, -1<y<1$.

PART B - (4 X16 = 64 marks)

09. (a) (i) Using Gauss Elimination method solve **(8)**

$x+2y+z=3,\ 2x+3y+3z=10,\ 3x-y+2z=13.$

(ii) Using Gauss Jordan method solve **(8)**

$3x+4y+5z=18,\ 2x-y+8z=13,\ 5x-2y+7z=20.$

(OR)

(b) (i) Using Newton's method, find the root between 0 and 1 of **(8)**

$x^3=6x-4$ correct to 5 decimal places.

(ii) Using power method, find the dominant eigen value and the **(8)**

corresponding eigen vector of $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$.

10. (a) (i) By the method of least squares find the best fitting straight line to the data. **(8)**

x	5	10	15	20	25
y	16	19	23	26	30

(ii) From the following data, find y at $x=43$ and $x=84$. **(8)**

x	40	50	60	70	80	90
y	184	204	226	250	276	304

(OR)

(b) (i) Using Newton's divided difference formula find $f(2)$ **(8)**

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

(ii) Using Lagrange's formula, find $y(9.5)$ given **(8)**

x	7	8	9	10
y	3	1	1	9

11. (a) (i) Find the first derivative of the function tabulated below at $x=50$ **(8)**

x	50	51	52	53	54	55	56
y	3.684	3.7084	3.7325	3.7563	3.7798	3.803	3.8259

(ii) Evaluate $\int_0^{\pi} \sin x dx$ using Trapezoidal and Simpson rules by dividing the range into 10 equal parts. **(8)**

(OR)

(b) (i) By Trapezoidal rule, find $\int_1^2\int_1^2 \frac{dxdy}{x+y}$, take $h = k = 0.25$. **(8)**

(ii) By Gaussian 3 point formula, evaluate $\int_0^1 \frac{dx}{1+x}$. **(8)**

12. (a) (i) Using Modified Euler method, find the values of y at $x = 0.1$ and $x = 0.2$ from $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$. **(8)**

(ii) Using Milne's method, find $y(2)$ given $\frac{dy}{dx} = \frac{1}{2}(x+y), y(0) = 2, y(0.5) = 2.636, y(1) = 3.595$ and $y(1.5) = 4.968$. **(8)**

(OR)

(b) (i) Find $y(0.1), z(0.1)$ by Runge Kutta method of fourth order from the system equations, $\frac{dy}{dx} = x + z, \frac{dz}{dx} = x - y^2$ given $y(0) = 2, z(0) = 1$. **(16)**