**Total No. of Questions : 3]**

**SEAT No. :** ____

**P-1291**

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# [6055]-104

# S.Y. B.Sc. (Computer Science)

# MATHEMATICS

## MTC-232 : Numerical Techniques

## (2019 Pattern) (Semester - III) (Paper - II) (23222)

***Time : 2 Hours]*** ***[Max. Marks : 35***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Non-programmable scientific calculator is allowed.***

***Q1)*** **Attempt any five questions out of seven :** **[5 × 2 = 10]**

a) Find the percentage error if 625.483 is approximated to three significant figures.

b) Write the Newton Raphson formula for square root of any real number.

c) State the Newton's Divided Difference formula.

d) Prove that : $\Delta = E - 1$ by usual notations.

e) Given that $\frac{dy}{dx} = y - x$ with $y(0) = 1$. Find $y(0.1)$ by Euler's method.

f) Given $f(1) = 7, f(2) = 10, f(3) = 13, f(4) = 16, f(5) = 19$ construct the Newton's Backward difference table.

g) Evaluate $\int_0^6 x^2 dx$ by trapezoidal rule. Take $h = 2$.

***P.T.O.***

*Q2)* **Attempt any three of the following :** **[3 × 5 = 15]**

a) Find the cubic polynomial by Lagrange's interpolation which takes the following data :

| $x$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $f(x)$ | 1 | 0 | 1 | 10 |

b) Find a real root of the equation $f(x) = x^3 - 2x - 5 = 0$ in [2, 3] by the method of false position correct upto two decimal places.

c) Derive Simpson's $(1/3)^{rd}$ rule for numerical integration.

d) The population of a town in the decennial census is given as below :

| Year X | 1891 | 1901 | 1911 | 1921 | 1931 |
|---|---|---|---|---|---|
| Population Y (in thousands) | 46 | 66 | 81 | 93 | 101 |

Estimate the population for the year 1895 by Newton's Forward Interpolation Formula.

e) Solve by Euler's modified method the initial value problem $\frac{dy}{dx} = 1 - y$ with initial conditions $y(0) = 1$ and compute $y(0.1)$. Take $h = 0.1$.

*Q3)* **Attempt any one of the following :** **[1 × 10 = 10]**

a) i) Using Newton's Divided Difference formula, calculate the value of $f(6)$

| $x$ | 1 | 2 | 7 | 8 |
|---|---|---|---|---|
| $f(x)$ | 1 | 5 | 5 | 4 |

ii) Using Trapezoidal rule evaluate $\int_0^6 f(x)\,dx$ form the following data :

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $f(x)$ | 1 | 0.7071 | 0.5773 | 0.5 | 0.4472 | 0.4082 | 0.3780 |

b) Given $\frac{dy}{dx} = x - y$ with $y(0) = 1$. Find $y(0.1)$ and $y(0.2)$ by using Runge - Kutta method of fourth order.

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