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# 322411 (14)

**BE (4th Semester)**

**Examination, Nov.- Dec., 2021**

**Branch : CSE, IT**

## COMPUTATIONAL MATHEMATICS

***Time Allowed : Three Hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

**Note :** In each question part (a) is compulsory carry 2 marks and solve any other two parts from (b), (c) & (d) carrying 7-7 marks.

**Q. 1.** (a) Bisection method is also known as ..... 2

(b) Find a positive root of $xe^x = 2$ by the method of Regula Falsi method. 7

(c) Using Newton-Raphson method, find the real root of $x \log_{10} x = 1.2$ correct to four decimal places. 7

(d) Use synthetic division and perform two iterations of the Birge-Vieta method to find the smallest positive root of the equation : 7

$x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$, $P_0 = 0.5$.

Q. 2. (a) The preceding method of solving simultaneous linear equations are known as ..... method. 2

(b) Solve by Crout's method of the following : **7**

$x + y + z = 3$, $2x - y + 3z = 16$, $3x + y - z = -3$.

(c) Solve by Gauss-Seidal iteration method of the following equations : **7**

$20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$.

(d) Solve the equations : **7**

$10x - 2y - 3z = 205$, $-2x + 10y - 2z = 154$, $-2x - y + 10z = 120$ by Relaxation method.

Q. 3. (a) Evaluate $\Delta^4\left[(1-x)(1-2x)(1-3x)(1-4x)\right]$ if the interval of differencing is 1. 2

(b) The table gives the distance in nautical miles of visible horizon for the given heights in feet above the earth's surface : 7

| x (height) | : | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|
| y (distance) | : | 10.63 | 13.03 | 15.04 | 16.81 | 18.42 | 19.90 | 21.27 |

Find the value of y when (i) x = 218 ft.

(ii) x = 410 ft.

(c) Apply Bessel's formula to obtain $y_{25}$, given $y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$ and $y_{32} = 3992$. 7

(d) Given the values : 7

| x | 5 | 7 | 11 | 13 | 17 |
|---|---|---|---|---|---|
| f(x) | 150 | 392 | 1452 | 2366 | 5202 |

Evaluate f(9), using (i) Lagrange's formula

(ii) Newton's divided difference formula.

**Q. 4.** (a) Define Numerical Integration. 2

(b) Given that : 7

| x | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|---|
| y | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at (i) $x = 1.1$, (ii) $x = 1.6$.

(c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using : 7

(i) Trapezoidal rule

(ii) Simpson's 1/3 rule

(iii) Simpson's 3/8 rule

(d) The following table gives the velocity v of a partical at time t : 7

| t(second) | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|
| v(m/sec) | 4 | 6 | 16 | 34 | 60 | 94 | 136 |

Find the distance moved by the particle in 12 seconds.

**Q. 5.** (a) Write Taylor series, for solution of equation

$$\frac{dy}{dx} = f(x, y), \text{ at } y(x_0) = y_0. \quad 2$$

(b) Find the value of y for x = 0.1 by Picard's method, given that : 7

$$\frac{dy}{dx} = \frac{y - x}{y + x}; y(0) = 1$$

(c) Apply Runge-Kutta method to find approximate value of y for x = 0.2, in step of 0.1, if $\frac{dy}{dx} = x + y^2$, given that y = 1, where x = 0. **7**

(d) Given $\frac{dy}{dx} = x^2(1+y)$ and y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979, evaluate y(1.4) by Adams-Bashforth method. **7**