CS-301/TCS-305          1037/1039

### Odd Semester Examination, 2017-18

## B.TECH. (SEMESTER-III) (EEE/ECE)

## COMPUTER BASED NUMERICAL TECHNIQUES

Time: 03:00 Hours                                          Max Marks : 75

Note - Attempt all questions.

Attempt **any three** parts of the following:                    [5x3=15]

(a)   Explain the method of Newton Raphson for computing roots. Apply it for finding x from $x^2 - 25 = 0$.

(b)   Find a real root of the equation $\cos x = 3x - 1$ correct to 3 decimal places using iteration method.

(c)   Find a real root of the equation $x^3 - x - 1 = 0$ by Bisection method upto 2 decimal places.

(d)   Find $\int_0^1 \frac{1}{1+x^2} dx$ by Trapezoidal rule.

(e)   Find a positive real root of the equation $x \log_{10} x - 1.2 = 0$ by Bisection-Method Correct to 2 decimal places.

Attempt any three parts of the following:                    [5x3=15]

(a)   Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Weddle's Rule

(b)   Find the velocity at t=4 sec. from the following table:

| Time(t)     | 1 | 2 | 4 | 8  | 10 |
|-------------|---|---|---|----|----|
| Distance(x) | 0 | 1 | 5 | 21 | 27 |

(c)   For the differential equation : $\frac{dy}{dx} = x - y^2$   y (0)=0

Calculate y(0.2) by Picard method to third approximation

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(d) The distance covered by an athelete for the 50 meter race is given in the following table :

| Time(sec) : | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Distance; | 0 | 2.5 | 8.5 | 15.5 | 24.5 | 36.5 | 50 |

Determine the speed of athelete at 5 sec. correct to two decimals.

(e) Evaluate $\int_{3}^{3.2} \log x \, dx$, by Numerical Integration.

3. Attempt any **two** parts of the following:                                        [7.5x2=15]

(a) Find $\frac{dy^2}{dx}$ at x =0.1 from the following table:

| x : | 0.1 | 0.2 | 0.3 | 0.4 |
|---|---|---|---|---|
| y : | 0.9975 | 0.9900 | 0.9776 | 0.9604 |

(b) A river is 80 m wide. The depth 'y' of the river at a distance 'x' from one bank is given by the following table:

| x : | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|---|
| y : | 0 | 4 | 7 | 9 | 12 | 15 | 14 | 8 | 3 |

Find the approximate area of cross-section of the river.

(c) Using Newton Divided difference formula , calculate the value of f(6)from the following data:

| x : | 1 | 2 | 7 | 8 |
|---|---|---|---|---|
| y : | 1 | 5 | 5 | 4 |

4. Attempt any **two** parts of the following:                                        [7.5x2=15]

(a) Using Gauss Backward interpolation formula, find the population for the year 1936 given that

| Year : | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 |
|---|---|---|---|---|---|---|
| Population (in thousands) : | 12 | 15 | 20 | 27 | 39 | 52 |

(b) What is statistical quality control ? write the importance of SAMPLING in quality control.

(c) Prove that (i) $\Delta \log f(x) = \log [1 + \Delta f(x)/ f(x)]$

(ii) $E = 1 + \Delta$

5. Attempt any **two** parts of the following: [7.5 x 2 =15]

(a) A manufacturer claims that only 4% of his product supplied by him are defective. A random sample of 600 products contains 36 defective. Test the claim of manufacturer.

(b) Apply Gauss –Seidal iteration method to solve the following equations(Only two approximations):

$20 x + y - 2 z = 10$
$3 x + 20y - z = -18$
$2 x - 3 y + 20 z = 52$

(c) Fit a straight line to the following data using Principle of Least square :

| x: | 1 | 2 | 3 | 4 | 6 | 8 |
|----|-----|---|-----|---|---|---|
| y  | 2.4 | 3 | 3.6 | 4 | 5 | 6 |

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Suggested replacements/ corrections in out of syllabus questions in the subject TCS-301/TCS-305(CBNT)

**Q2 (b)** Find the cubic polynomial which takes the following values:

| x: | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| y: | 1 | 2 | 1 | 10 |

**Q2 (c)** Using Bessel's formula, find f(25) from the following table :

| X : | 20 | 24 | 28 | 32 |
|---|---|---|---|---|
| f(x) : | 2854 | 3162 | 3544 | 3992 |

**Q3 (a)** Find $dy^2/dx$ must read as $dy/dx$.

**Q3 (c)** From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age of 46

| age: | 45 | 50 | 55 | 60 | 65 |
|---|---|---|---|---|---|
| Premium: | 114.84 | 96.16 | 83.32 | 74.48 | 68.48 |

**Q5 (b)** Find the least square fit of the form $y = a + bx^3$ to the following data:

| x | -1 | 0 | 1 |
|---|---|---|---|
| y | 2 | 5 | 3 |