**B.E. PRINTING ENGINEERING**
2nd Year, 1st Semester Examination, 2019

**COMPUTATIONAL STUDIES** **Time- Three Hours** **Full Marks-100**

Answer ***Question no. 1*** and ***any four*** from the rest

1. (i) **Answer all questions**: (4x5) =20

a) How can we establish the hypothesis of Interpolation using a function in its graphical representation?

b) Derive the equivalence between Lagrangian and Newtonian interpolations.

c) Why Newton-Raphson method is called as a method of tangent?

d) When can we derive relation between Forward and Backward differences?

2. a. Derive the Lagrangian Interpolation formula. What are the advantages and disadvantages of Lagrangian Interpolation formula?
b. Find by Lagrangian interpolation formula the interpolating polynomial which corresponds to the following data:

| $x$ | -1 | 0 | 2 | 5 |
|---|---|---|---|---|
| $f(x)$ | 9 | 5 | 3 | 15 |

(6+4)+10=20

3. a. Derive the divided difference of $n^{th}$ order? Write a C Program to calculate the divided difference of $n^{th}$ order by using a function where $n$ will be supplied by user.
b. Construct the difference table from the following table and compute $f(21)$ by Newton's backward formula.

| $x$ | 0 | 5 | 10 | 15 | 20 |
|---|---|---|---|---|---|
| $f(x)$ | 1.0 | 1.6 | 3.8 | 8.2 | 15.4 |

(4+6)+10=20

4. a. Derive Trapezoidal rule from Newton's Forward Difference Formula. Write a C function for calculating Simpson's $1/3^{rd}$ formula for $n$ number of user given $x$ and $f(x)$ values.

   b. Evaluate $\int_4^{5.2} lnx\, dx$ using Simpson's $1/3^{rd}$ formula and compare the result with the exact value. Take $h$=0.1.

(5+5)+10=20

5. a. How do you find out real roots of an equation $f(x) = 0$ using Newton-Raphson method? Write an algorithm for Bisection method.

   b. Find a real root of the equation using Bisection method up to 3 significant figures.

$f(x) = x^3+x^2+x+7$

(5+5)+10=20

6. Write down the short notes for the followings
   a. Cote's Quadrature
   b. Regula-Falsi Method

10+10=20