



NS – 621

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III Semester B.C.A. Degree Examination, Nov./Dec. 2016
(Y2K8 Scheme) (Repeaters)
COMPUTER SCIENCE

BCA 306 : Numerical Analysis and Linear Programming

Time : 3 Hours

Max. Marks : 60/70

- Instructions :** 1) Answer *all* Sections.
2) Section **D** is applicable *only* for the students of **2012-13** and onwards.
3) **60** marks for Repeater students prior to **2012-13**.

SECTION – A

I. Answer **any five** of the following :

- 1) Define relative error.
- 2) Find the sum of 0.123×10^3 and 0.456×10^2 .
- 3) Define Interpolation.
- 4) Write the formula for Newton-Raphson method.
- 5) Write the formula for Simpson's one-third rule for integration.
- 6) Construct the difference table for the following data :

| | | | | |
|------|----|----|----|----|
| x | 5 | 6 | 9 | 11 |
| f(x) | 12 | 13 | 14 | 16 |

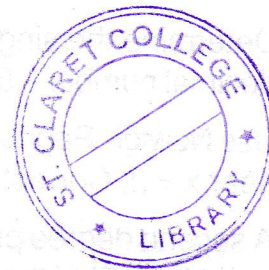
- 7) Write the formula for the conversion of the integer N in decimal system to the binary number.
- 8) Define feasible region of a LPP.

SECTION – B

II. Answer **any three** of the following :

- 9) Find the real root of the equation $x^3 - 4x - 9 = 0$. Which lies in the interval (2, 3) using bisection method in four stages.
- 10) Using Lagrange's interpolation formula find f(6) from the following data :

| | | | | |
|------|-----|-----|----|----|
| x | 3 | 7 | 9 | 10 |
| f(x) | 168 | 120 | 72 | 63 |



(5x2=10)



- 11) Evaluate $\int_1^2 \frac{dx}{x}$, using Trapezoidal rule, by taking $h = 0.25$.
- 12) Solve $20x + y - 2z = 17$, $3x + 20y - z = -18$ and $2x - 3y + 20z = 25$ using Gauss-Seidal method.
- 13) Solve $\frac{dy}{dx} = x + y^2$, $y(0) = 1$ by Picard's method upto 2nd approximation for $x = 0.1$.

SECTION - C

III. Answer any five of the following :

(5×7=35)

- 14) Determine the single precision and double precision representation of the decimal number - 52234375.
- 15) Use Newton-Raphson method to find the real root of the equation $x^3 - 2x - 5 = 0$ near $x = 2$. Correct to three decimal places.
- 16) A second degree polynomial passes through the points (1, -1), (2, -1), (3, 1) and (4, 5). Find the polynomial.
- 17) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by dividing into 6 equal parts.
- 18) Solve by Gauss elimination method $2x + y + 4z = 12$, $4x + 11y - z = 33$, $8x - 3y + 2z = 20$.
- 19) Solve $\frac{dy}{dx} = x + y^2$; $y(0) = 1$ for $x = 0.2$ using Runge-Kutta method.

- 20) a) A diet for a sick person must contain atleast 4000 units of vitamins, 50 units of minerals and 1400 calories. Two foods A and B available at a cost of Rs. 5 and Rs. 4 per unit respectively. If one unit of A contains 200 units of vitamin, 1 unit of mineral and 40 calories and one unit of food B contain 100 units of vitamins, 2 units of minerals and 40 calories. Formulate the LPP (minimum).

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- b) Solve using graphical method

$$\text{Max, } z = 5x + 7y, \text{ Subject to } x + y \leq 4$$

$$3x + 8y \leq 24$$

$$10x + 7y \leq 35, x, y \geq 0.$$

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21) Solve by Simplex method

Max $z = 30x + 50y$ subject to constraints

$$2x + y \leq 16$$

$$x + 2y \leq 11$$

$$x + 3y \leq 15, \quad x, y \geq 0.$$

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SECTION - D

IV. Answer **any one** of the following :

(1×10=10)

22) a) Write the dual of the following LPP.

Max $z = x_1 + 2x_2 + x_3$ subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6, \quad x_1, x_2, x_3 \geq 0.$$

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b) Find a real root of the equation $f(x) = x^4 - x - 10 = 0$ by using secant method. Perform only 4 iterations.

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23) a) Evaluate $f(4)$ using Newtons divided difference formula :

| | | | | |
|-------------|----|---|----|-----|
| x | 0 | 2 | 3 | 6 |
| f(x) | -4 | 2 | 14 | 158 |

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b) Use Taylors series method to find y at $x = 0.1$ considering terms upto the third degree given $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$.

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