

3E1656

Roll No. \_\_\_\_\_

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**B. Tech. III Semester (Main/Back) Examination-2014**  
**Computer Engg. & Information Tech.**  
**3CS6A & 3IT6A Advanced Engg. Mathematics-I**

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

**Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

**Unit - I**

1. a) Show  $f(x) = 4x^3 - 18x^2 + 27x - 7$  is never optimal in a given interval except at its end points
- b) Find the volume of the greatest parallelopiped that can be inscribed in the ellipsoid.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

**OR**

1. a) Minimize  $f = 9 - 8x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + 2x_1x_2 + x_3^2 + 2x_1x_3$   
 Subject to  $x_1 + x_2 + 2x_3 = 3$   
 by constrained variation method.
- b) A rectangular box of height  $a$  width be  $b$  is placed adjacent to a wall. Find the length of the shortest ladder that can be made to lean against the wall.

**Unit - II**

2. a) Solve graphically.  

$$\text{Max. } Z = 6x_1 + 15x_2$$

$$\text{Subject to } 5x_1 + 3x_2 \leq 15$$

$$2x_1 + 5x_2 \leq 10$$

$$x_1, x_2 \geq 0$$

Show that this is an example of infinite solutions.

- b) Write the dual of the problem.

$$\text{Max. } Z_p = 2x_1 + 4x_2$$

$$\text{Subject to } 2x_1 + 3x_2 \leq 48$$

$$x_1 + 3x_2 \leq 42$$

$$x_1 + x_2 \leq 21$$

$$x_1, x_2 \geq 0$$

OR

2. a) Solve by simplex method.

$$\text{Min. } Z = x_1 - 3x_2 + 2x_3$$

$$\text{Subject to } 3x_1 - x_2 + 3x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$x_1, x_2, x_3 \geq 0$$

- b) Solve the following assignment problem.

	1	2	3	4
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

Unit - III

3. a) Define the following:

- i) Modulus or absolute value.
- ii) Euclidean algorithm.
- iii) Rational numbers.
- iv) Prime numbers.

- b) If there is open statement or a property  $P_n$ , involving the number  $m \in N$  which is true and whenever it is true for  $n$ , prove that it is true for  $n+1$  also, giving.

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

OR

3. a) Prove that every infinite cyclic group has two and only two generators.

- b) Show that the set  $t(g) = \left\{ \begin{bmatrix} a & 0 \\ b & 0 \end{bmatrix} \mid a \in z, b \in z \right\}$  is an ideal of the ring

$$R = \left\{ \begin{bmatrix} a & 0 \\ b & c \end{bmatrix} \mid a, b, c \in z \right\}$$

Matrix addition and matrix multiplication being the operations of the system.

**Unit - IV**

4. a) Prove that Laplace transform of the error function is

$$L[\operatorname{erf} \sqrt{t}] = \frac{1}{s\sqrt{1+s}} \text{ if } \operatorname{erf}(\sqrt{t}) = \frac{2}{\sqrt{\pi}} \int_0^t e^{-u^2} du$$

- b) Solve the following equation by Laplace transform

$$(D^2 + m^2)y(t) = a \sin nt \text{ given } y(0) = y'(0) = \infty$$

**OR**

4. a) Find the inverse Laplace transform of the following:

$$\frac{1}{S^4} + \frac{a}{S^2 + a^2} + \frac{S}{S^2 + b^2} + \frac{S-a}{(S-a)^2 + b^2} + \frac{S-b}{(S-b)^2 + a^2}$$

- b) Solve by Laplace transform  $\frac{\partial u}{\partial x} - \frac{\partial u}{\partial t} = 1 - e^{-t}$  in  $0 < x < 1$ , under the initial conditions  $u(x, 0) = x$

**Unit - V**

5. a) The ordinate of the normal curve are given by the following table:

x	0.0	0.2	0.4	0.6	0.8
y	0.3989	0.3910	0.3683	0.3332	0.2897

- b) Find the value of  $\log_e 2$  from

$$\int_0^1 \frac{1}{1+x^3} dx \text{ using Simpson's } \frac{1}{3} \text{ rule taking four equal intervals.}$$

**OR**

5. a) Using Picard's method, obtain the solution of

$$\frac{dy}{dx} = x + x^4 y$$

Tabulate: i)  $y(0.1)$

ii)  $y(0.2)$

b) Use Runge-Kutta fourth method to

solve:  $\frac{dy}{dx} = -2xy^2, y(0) = 1$  with  $h = 0.2$

for i)  $x = 0.2$

ii)  $x = 0.4$

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