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3E1656

B.Tech. III Semester (Main/Back) Examination Dec.- 2016

Computer Sc. & Engg.

3CS6A Advanced Engg. Mathematics - I

CS,IT

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

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) Explain Engineering application of optimization Techniques. **(8)**

b) Find the extreme point of the function.

$$f(x_1, x_2) = x_1^3 + x_2^3 + 9x_1^2 + 18x_2^2 + 144$$ **(8)**

OR

1. a) A rectangular sheet of metal of sides a and b has four equal square portions removed at the corners and the sides are then turned up so as to form an open rectangular box. Find the depth of the box when the volume of the box is maximum. **(8)**

b) Maximize $z = 6x_1 + 8x_2 - x_1^2 - x_2^2$

s.t $4x_1 + 3x_2 = 16$

$3x_1 + 5x_2 = 15, \quad x_1, x_2 \geq 0$ **(8)**

Unit - II

2. a) Solve the following pinear programming problem by graphical method.

Min $z = 2x_1 + 3x_2$

s.t $x_1 + x_2 \le 4$
$6x_1 + 2x_2 \ge 8$
$x_1 + 5x_2 \ge 4$
$x_1 \le 3$
$x_2 \le 3$
$x_1, x_2 \ge 0$ **(8)**

b) Solve the following transportation problem to maximize the profit **(8)**

To / From		Destination 1	2	3	4	Suply
Origin	A	90	90	100	110	200
	B	50	70	130	85	100
Demand		75	100	100	30	300
						305

OR

2. a) Solve the following LPP **(8)**

Maximize $z = -4x_1 - 3x_2 - 9x_3$

s.t $2x_1 + 4x_2 + 6x_3 \ge 15$

$6x_1 + x_2 + 6x_3 \ge 12$

$x_1, x_2, x_3 \ge 0$

b) Write the dual of the linear programming problem

Maximize $z = x_1 - 2x_2 + 3x_3$

s.t. $2x_1 + 5x_3 \le 16$

$5x_2 + 4x_3 \ge 18$

$x_1 + x_2 + x_3 = 10$

$x_1 \ge 0$, $x_2 \le 0$, x_3 unrestricted in sign **(8)**

Unit - III

3. a) Define the following : **(8)**

   i. Jacobi symbol

   ii. Sieve of Eratosthenes

   b) State and prove the chinese Remainder Theorem. **(8)**

OR

3. a) Suppose n is a positive integer and k is relatively prime to n then : $k^{\phi(n)} \equiv 1 (\text{mod } n)$ **(8)**

   b) If $\{G,*\}$ is a finite cyclic group generated by on element $a \in G$ and is of order n, then $a^n = e$ so that $G = \{a, a^2, ..., a^n (= e)\}$. Also n is the least positive integer for which $a^n = e$ **(8)**

Unit - IV

4. a) Obtain the Laplace transform of

$$f(t) = \frac{1 - \cos t}{t^2}$$ **(8)**

   b) Use Laplace transform to solve the following differential equations

$$(D^2 + 1)x = t \cos 2t, x(0) = 0, x'(0) = 0$$ **(8)**

OR

4. a) Use convolution theorem to evaluate

$$L^{-1}\left\{\frac{s}{(s^2 + a^2)^2}\right\}$$ **(8)**

   b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with the boundary conditions

$$u(x,0) = 3 \sin 2\pi x$$
$$u(0,t) = 0$$
$$u(1,t) = 0 \quad where\ 0 < x < 1,\ t > 0$$ **(8)**

Unit - V

5. a) Use stirling formula to find f(11), given that **(8)**

x :	2	6	10	14	18
y :	21.857	21.025	20.132	19.145	18.057

b) Use picards methods to solve

$\frac{dy}{dx} = 1 + xy$ given that y(0) = 1

Tabulated y(0.1), y(0.2) **(8)**

OR

5. a) Use Lagrange's interpolation formula to find the value of x when y = 15 if the following value of x and y are given **(8)**

x:	5	6	9	14
y :	12	13	14	16

b) Apply Runge - Kutta Fourth order method to find an approximate value of y when x = 0.2 given that **(8)**

$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1
