(b) A semi infinite solid $x > 0$ is initially at temperature zero. At time $t > 0$, a constant temperature $v_o > 0$ is applied and maintained at the face $x = 0$. Find the temperature at any point of the solid at any time $t > 0$. [8]

OR

Q. 4 (a) Find $L^{-1}\left\{\frac{3s+7}{s^2 - 2s - 3}\right\}$ [8]

(b) Solve $(D^2 + g)\, y = \text{Cos}2t$, where $y(0) = 1$, $y(\pi/2) = -1$. [8]

UNIT – V

Q. 5 (a) Using Sterling's formula, find f (28), [8]

Given $f(20) = 49225$, $f(25) = 48316$, $f(30) = 47236$, $f(35) = 45926$, $f(40) = 44306$.

(b) Use Euler's modified method to solve [8]

$\frac{dy}{dx} = x^2 + y$ with $y(0) = 0.94$. Find $y(0.1)$.

OR

Q.5 (a) Find $\frac{dy}{dx}$ at $x = 5$ from the following table - [8]

x	0	2	3	4	7	9
y	4	26	58	112	466	922

(b) Use Milne's method to find y (0.8) from - [8]

$\frac{dy}{dx} = 1 + y^2$

Give $y(0) = 0$, $y(0.2) = 0.2027$, $y(0.4) = 0.4228$, $y(0.6) = 0.6841$.

--------x--------x-------

Roll No. ____________ Total No of Pages: 4

3E1656

3E1656
B. Tech. III Sem. (Main / Back) Exam., Feb. 2015
Computer Science
3CS6A Advanced Engineering Mathematics – I
Common for CS, IT

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks:
Main: 26
Back: 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.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. Graph Paper 2. NIL

UNIT – I

Q. 1 (a) Find the extreme points of the function. [8]

$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$

(b) Find the dimensions of a box of largest volume that can be inscribed in sphere of radius a. [8]

OR

Q. 1 (a) Explain applications of optimization techniques in Engineering [8]

(b) Optimize $z = \frac{1}{2}(x^2 + y^2 + z^2)$ [8]

Subject to $x - y = 0$; $x + y + z - 1 = 0$.

UNIT – II

Q. 2 (a) Solve the following linear programming problem by graphical method: [8]

Min $z = 2x_1 + 3x_2$

S.t. $x_1 + x_2 \le 4$

$6x_1 + 2x_2 \ge 8$

$x_1 + 5x_2 \ge 4$

$x_1 \le 3$; $x_2 \le 3$

and $x_1, x_2 \ge 0$

(b) Solve the following transportation problem: [8]

To → From ↓	1	2	3	Available ↓
A	16	19	12	14
B	22	13	19	16
C	14	28	8	12
Demand	10	15	17	

OR

Q. 2 (a) Solve the following problem. [8]

Minimize $Z = \frac{15}{2}x_1 - 3x_2$

Subject to $3x_1 - x_2 - x_3 \ge 3$

$x_1 - x_2 + x_3 \ge 2$

and $x_1, x_2, x_3 \ge 0$

(b) Write the dual of the linear programming problem: [8]

Min $Z = 2x_1 + 3x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + 5x_3 \ge 2$

$3x_1 + x_2 + 7x_3 = 3$

$x_1 + 4x_2 + 6x_3 \le 5$

and $x_1, x_2 \ge 0$; x_3 is unrestricted in sign

UNIT – III

Q. 3 (a) If p is a prime and a is an integer relatively prime to p, then prove that –

$a^{p-1} \equiv 1 \bmod p$. [8]

(b) Show that $z_5 = \{0, 1, 2, 3, 4\}$ is an abelian group for the operation $+_5$ defined as. [8]

$$a +_5 b = \begin{cases} a+b & \text{if } a+b<5 \\ a+b-5 & \text{ij } a+b \ge 5 \end{cases}$$

OR

Q. 3 (a) Define the following - [4 × 2 = 8]

(i) Sieve of Eratosthenes

(ii) Legendre Symbol

(b) Prove that a non-void subset H of a group G is a subgroup

iff $a \in H, b \in H \ni ab^{-1} \in H$ [8]

UNIT – IV

Q. 4 (a) Find $L\left\{\frac{\text{Sint}}{t}\right\}$ and then prove that $\int_0^\infty \frac{\text{Sint}}{t} dt = \frac{\pi}{2}$ [8]