

3E1656	Roll No. _____	Total No of Pages: 4
<p>3E1656</p> <p>B. Tech. III Sem. (Main / Back) Exam., Feb. 2015</p> <p>Computer Science</p> <p>3CS6A Advanced Engineering Mathematics – I</p> <p>Common for CS, IT</p>		

Time: 3 Hours
Maximum Marks: 80
Min. Passing Marks: 26
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 $x - y = 0; x + y + z - 1 = 0.$

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- (b) A semi infinite solid $x > 0$ is initially at temperature zero. At time $t > 0$, a constant temperature $v_0 > 0$ 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 $(D^2 + g)y = \cos 2t$, 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 $\frac{dy}{dx} = x^2 + y$ with $y(0) = 0.94$. Find $y(0.1)$. [8]

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

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UNIT - II

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

Min $z = 2x_1 + 3x_2$

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

$6x_1 + 2x_2 \geq 8$

$x_1 + 5x_2 \geq 4$

$x_1 \leq 3; x_2 \leq 3$

and $x_1, x_2 \geq 0$

(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 $3x_1 - x_2 - x_3 \geq 3$

$x_1 - x_2 + x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$

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

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

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

$3x_1 + x_2 + 7x_3 = 3$

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

and $x_1, x_2 \geq 0; x_3$ 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 -

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

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

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

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 $a \in H, b \in H \Rightarrow ab^{-1} \in H$ [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]

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