3E1656

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B. Tech. (Sem. III) (Main/Back) Examination, December - 2017
Computer Sc. & Engg.
3CS6A Advanced Engg. Mathematics - I

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

*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 materials is permitted during examination. (Mentioned in form No. 205)

1. Nil 2. Nil

UNIT - I

1 (a) Define optimization techniques and write its various engineering applications 8

(b) Solve the problem by constrained variation method.

Min $f(X)=\frac{1}{2}\left(x_1^2+x_2^2+x_3^2\right)$

Sub. to $g_1(X)=x_1=x_2$

$g_2(X)=x_1+x_2+x_3=1$ 8

OR

1 (a) Optimize $Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2.$

Subject to $x_1 + x_2 + x_3 = 15,$

$2x_1 - x_2 + 2x_3 = 20,$

$x_1, x_2, x_3 \geq 0$

8

(b) Maximum $Z = 2x_1 + 3x_2 - \left(x_1^2 + x_2^2 + x_3^2\right)$

Subject to $x_1 + x_2 \leq 1,$

$2x_1 + 3x_2 \leq 6,$

$x_1, x_2 \geq 0$

8

UNIT - II

2 (a) A firm manufacturing two types of electric items, A and B can make a profit of Rs. 20 per unit of A and Rs. 30 per unit of B. Each unit of A requires 3 motors and 4 transformers and each unit of B requires 2 and 4 respectively. The supply of these per month is 210 and 300 respectively. Type B requires a stabilizer with supply of 65 units per month. Formulate the LPP for maximum profit and solve it graphically.

8

(b) User two-phase method to solve :

Min $Z = x_1 + x_2,$

Subject to $2x_1 + x_2 \geq 4,$

$x_1 + 7x_2 \geq 7$

and $x_1, x_2 \geq 0$

8

OR

2 (a) Find the dual of the problem

Min $Z = 2x_2 + 5x_3$

Subject to $x_1 + x_2 \geq 2,$

$2x_1 + x_2 + 6x_3 = 6,$

$x_1 - x_2 + 3x_3 \leq 4$

and $x_1, x_2, x_3 \geq 0$

(b) Solve the following transportation problem to minimize the cost

TO / From	D_1	D_2	D_3	Supply
A	2	7	4	5
B	3	3	1	8
C	5	4	7	7
D	1	6	2	14
Demand	7	9	18	34

8

UNIT - III

3 (a) If p is prime and a is an integer not divisible by p, then prove $a^{p-1} \equiv 1(\bmod p)$

8

(b) State the Chinese Remainder Theorem. And solve the linear system $x \equiv 1(\bmod 3), x \equiv 2(\bmod 4), x \equiv 3(\bmod 5)$

8

OR

3 (a) Show that the set $U_9 = \{1, 2, 3, 5, 7, 8\}$ with an operation defined as multiplication modulo 9, i.e. $a \cdot b = 9m + c$ for all $a, b \in U_9$ and $c \in U_9$ is a cyclic group.

Find the order of various elements and subgroup generated by them.

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 $G = \{a, a^2 \ldots\ldots a^n (= e)\}$. Also n is the least positive integer for which $a^n = e$.

8

UNIT - IV

4 (a) Find inverse L-transform of function of $\frac{s}{s^4+4a^4}$. 8

(b) Find the bounded solution $u(x,t), 0<x<1, t>0$ of the boundary value problem $\frac{\partial u}{\partial x}-\frac{\partial u}{\partial t}=1-e^{-t}, u(x,0)=x$. 8

OR

4 (a) Find Laplace transform of $\sin\sqrt{t}$ and deduce $L\left[\frac{\cos\sqrt{t}}{\sqrt{t}}\right]=\sqrt{\frac{\pi}{s}}e^{-\frac{1}{4s}}$. 8

(b) Solve $\frac{d^2y}{dt^2}-3\frac{dy}{dt}+2y=1-e^{2t}$; $y(0)=1$; $y'(0)=0$. 8

UNIT - V

5 (a) The population of a country is the decimal census were as under; estimate the population for the year 1925.

$Year(X)$	1891	1901	1911	1921	1931
$Population(in\ thousands)\ f(x)$	46	66	81	93	101

8

(b) Evalute $\int_0^1 \frac{1}{1+x^2}dx$ by Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule. Hence obtain the approximate value of π in each case. 8

OR

5 (a) Given $2\frac{dy}{dx}=\left(1+x^2\right)y^2$ *and* $y(0)=1$, evaluate $y(0.4)$ by Milne's Prodictor-corrector method. 8

(b) Solve $y_{n+2}+y_{n+1}+y_n=n^2+n+1$. 8