3E1656

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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.

$$\begin{aligned} &Max.\ Z = 6x_1 + 15x_2 \\ &Subject\ to\ 5x_1 + 3x_2 \le 15 \\ &\qquad 2x_1 + 5x_2 \le 10 \\ &\qquad x_1, x_2 \ge 0 \end{aligned}$$

Show that this is an example of infinite solutions.

b) Write the dual of the problem.

$$Max.\ Zp = 2x_1 + 4x_2$$
$$Subject\ to\ 2x_1 + 3x_2 \le 48$$
$$x_1 + 3x_2 \le 42$$
$$x_1 + x_2 \le 21$$
$$x_1,\ x_2 \ge 0$$

OR

2. a) Solve by simplex method.

$$Min.\ Z = x_1 - 3x_2 + 2x_3$$
$$Subject\ to\ 3x_1 - x_2 + 3x_3 \le 7$$
$$-2x_1 + 4x_2 \le 12$$
$$-4x_1 + 3x_2 + 8x_3 \le 10$$
$$x_1,\ x_2, x_3 \ge 0$$

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.

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

OR

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

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

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

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

Unit - IV

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

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

b) Solve the following equation by Laplace transform

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

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

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

OR

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

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

Tabulate: i) $y(0.1)$

ii) $y(0.2)$

b) Use Runga-Kutta forth method to

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

for i) $x = 0.2$

ii) $x = 0.4$