3E2071

Roll No. : _____ Total Printed Pages : 4

# 3E2071

**B.Tech. (Sem. III) (Main/Back) Examination, January - 2012**
**Computer Engg. & Information Tech.**
**3IT1 & 3CS1 Mathematics III**

Time : 3 Hours] [Total 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.*

Use of following supporting material is permitted during examination.
*(Mentioned in form No. 205)*

1. Nil 2. Nil

## UNIT – I

1 (a) The profit earned $p$, by a company is function of the units produced $(x)$ and is given by $p = 800x - 2x^2$. If the company's expenditure on interest, rent and salary of the staff be Rs. 1 lac, show that the company will always be in loss.

(b) Find the volume of the greatest right circular c one described by the revolution of a triangle of hypotenuse c about one of its sides.

**OR**

1 (a) Consider the following optimization problem :

Maximize $Z = -x_1 - x_2$

subject to $x_1^2 + x_2^2 - 2 \geq 0$

$$x_1 + 3x_2 - 4 \geq 0$$

$$-x_1 - x_2^4 + 30 > 0$$

Find the Lagrange multipliers.

(b) Solve the following problem :

Minimize $f(X) = x_1^2 + x_2^2 + x_3^2$

subject to $g_1(X) = 2x_1 + x_2 - 5 \leq 0$

$g_2(X) = x_2 + x_3 - 2 \leq 0$

$g_3(X) = 1 - x_1 \leq 0$

$g_4(X) = 2 - x_2 \leq 0$

$g_5(X) = -x_3 \leq 0$



## UNIT - II

2 (a) Find the dual of the following problem :

Maximize : $Z_p = 2x_1 + 3x_2 + x_3$

S.t. $4x_1 + 3x_2 + x_3 = 6$

$x_1 + 2x_2 + 5x_3 = 4$

$x_1, x_2, x_3 \geq 0$



(b) A company wishes to plan its advertising strategy. There are two media under consideration call them magazine I and magazine II. Magazine I has a reach of 2000 potential customers and Magazine II has a reach of 3000 potential customers. The cost per page of advertising is Rs. 400 and 600 in Magazine I and II respectively. The firm has a monthly budget of Rs. 6000. There is an important requirement that the total reach for the income group under Rs. 20,000 per annum, should not exceed 4000 potential customers. The reach in magazine I and II for this income group is 400 and 200 potential customers respectively. How many pages should be bought in the two magazines to maximise the total reach. Solve the problem graphically.

**OR**

2 (a) Solve the following transportation problem :

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|
| $O_1$ | 13 | 11 | 15 | 40 | 20 |
| $O_2$ | 17 | 14 | 12 | 13 | 60 |
| $O_3$ | 18 | 18 | 15 | 12 | 70 |
| Demand | 30 | 30 | 40 | 50 | 150 |

(b) Solve the following L.P.P. :

Max. $Z = 5x_1 + 3x_2$

s.t. $3x_1 + 5x_2 \leq 15$

$5x_1 + 2x_2 \leq 10$ and $x_1, x_2 \geq 0$

## UNIT - III

3 (a) Solve the following Minimal assignment problem :

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 2.5 | 5 | 1 | 6 | 2 |
| 2 | 2 | 5 | 1.5 | 7 | 3 |
| 3 | 3 | 6.5 | 2 | 8 | 3 |
| 4 | 3.5 | 7 | 2 | 9 | 4.5 |
| 5 | 4 | 7 | 3 | 9 | 6 |

(b) A department head has four subordinates and four tasks have to be performed. Subordinates differ in efficiency and tasks differ in their intrinsic difficulty. Time each man would take to perform each task is given in the effectiveness matrix. How the tasks should be allocated to each person so as to minimize the total man-hours.

| Tasks | *I* | *II* | *III* | *IV* |
|---|---|---|---|---|
| *A* | 8 | 26 | 17 | 11 |
| *B* | 13 | 28 | 4 | 26 |
| *C* | 38 | 19 | 18 | 15 |
| *D* | 19 | 26 | 24 | 10 |



**OR**

3 (a) Six jobs go first to machine I then to machine II. The order in which the jobs are completed has no significance. The following gives the machine time in hours for six jobs and two machines. Find the sequence of jobs that minimizes the total elapsed time to complete the job :

| Job | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Machine I | 5 | 9 | 4 | 7 | 8 | 6 |
| Machine II | 7 | 4 | 8 | 3 | 9 | 5 |

(b) Construct a network for the project whose activities and their precedence relationships are given below :

| Activity | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Immediate Predecessor | - | - | - | A | B | B | C | D | E | H, I | F, G |

## UNIT - IV

4 (a) If $f(t) = \frac{t}{a}$ for $t < a$

$= 1$ for $t > a$

show that :



$$Lf(t) = \frac{1-e^{-as}}{as^2}$$

(b) Find the inverse Laplace transform of

$$\frac{s+2}{s^2-4s+13}$$

**OR**

4 (a) Solve the equation by Laplace transform of $(D-1)(D-2)(D-3)x = 5$, when $x = 0 \quad x' = 0 \quad x_2'' = 0$.

(b) Solve the following equation by Laplace transform :

$\frac{dx}{dt} - 2x = 3e^t$ given $x(0) = 1$.

## UNIT - V

5 (a) Find the missing term of the following distribution :

| $x$ | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $y$ | $y_0 = 1$ | $y_1 = 8$ | ? | $y_3 = 64$ | $y_4 = 125$ |

(b) Apply Picards method of find the solution of $\frac{dy}{dx} = y - x$ with $x_0 = 0, y_0 = 2$ upto the third order approximation.

**OR**

5 (a) Apply Miline's predictor-corrector method to solve the following differential equation :

$\frac{dy}{dx} = x - y^2$, given that $y(0) = 0 \quad y(.2) = .02 \quad y(.4) = .0795 \quad y(.6) = .1762$

(b) Use Runge-Kutta forth order method to solve $\frac{dy}{dx} = -2xy^2$, $y(0) = 1$ with $h = 0.2$ for $x = 0.2$.