**R09**

**Code No: D7508**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012**
**OPERATIONS RESEARCH**
**(CONTROL SYSTEMS)**

**Time: 3hours** **Max. Marks: 60**

**Answer any five questions**
**All questions carry equal marks**

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1. $Max\ f = 5x_1 + 12x_2 + 4x_3$ st

   $x_1 + 2x_2 + x_3 \le 5$

   $2x_1 - x_2 + 3x_3 = 2$ and $x_i \ge 0,$

   a) Solve LPP

   b) Find the effect of change C to (4, 10,4) from (5,12,4)

2.a) State the various variants of assignment problem.

b) A manufacturer of complex electronic equipment has just received a sizable contract and plans to subcontract part of the job. He has solicited bids for 6 subcontracts from 3 firms. Each job is sufficiently large and any firm can take only one job. The table below shows the bids as well as cost estimates for doing the job internally. Not more than three jobs can be performed internally.

| Job / Firm | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | 44 | 67 | 41 | 53 | 48 | 64 |
| 2 | 46 | 69 | 40 | 45 | 45 | 68 |
| 3 | 43 | 73 | 37 | 51 | 44 | 62 |
| Internal | 50 | 65 | 35 | 50 | 46 | 63 |

Find the optimal assignment that will result in minimum total cost.

3. A machine shop has six machines A, B, C, D, E and F. Two jobs must be processed through each of these machines. The time spent on each machine and the necessary sequence of the jobs through the shop is given below:

| Order | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Job 1 | A - 25 | C - 15 | D - 15 | B - 35 | E - 30 | F - 30 |
| Job 2 | B - 30 | C - 35 | A - 15 | D - 15 | F - 20 | E - 25 |

In what sequence would the jobs be done on each of the machine in order to minimize the total time necessary to finish the jobs? Also determine the total elapsed time.

**Contd…..2**

4.a) Explain the following terms
i) Rectangular games ii) Saddle point iii) Payoff matrix.

b) Obtain the optimal strategies for both persons and the value of the game for zero-sum two-person game whose payoff matrix is given below:

$$\begin{bmatrix} 3 & 2 & 4 & 0 \\ 2 & 4 & 2 & 4 \\ 4 & 2 & 4 & 0 \\ 0 & 4 & 0 & 8 \end{bmatrix}$$

5. A salesman has to travel between A and B indicated by the network in figure

| | C | F | I |
|---|---|---|---|
| A | 6 | - | 4 |

| | F | D | G | J | E, K |
|---|---|---|---|---|---|
| C | 3 | 4 | - | - | - , - |
| F | - | - | 7 | - | 5, 5 |
| I | 2 | - | - | 6 | -, - |

| | G | E | K |
|---|---|---|---|
| D | 6 | 3 | - |
| G | - | - | - |
| J | 8 | - | - |

| | B |
|---|---|
| E | 7 |
| G | 2 |
| K | 6 |

Find the minimum distance travel by the salesman from A to B.

6.a) Mention drawbacks of Fibonacci method.

b) Find the min of $y = 6x^4 - 3x + 7$ over interval (0, 2) find using Golden section method within $\pm$ 0.1 of initial range.

7. Using Rosen Brock's Search method, Min $Y = 2 + (x_1^2 - x_2)^2 + x_2^2$. Take starting point as (-3,-4), $s_1 = s_2 = 0.5$ and $\alpha = 3$, $\beta = -0.5$. Show calculations for complete two cycles.

8 Solve the following GP problem

$$Min\ f = 20x_2x_3x_4^{\ 4} + 20x_1^{\ 2}x_3^{\ -1} + 5x_2x_3^{\ 2}$$

$$\text{St} \quad 5x_2^{\ -5}x_3^{\ -1} \le 1$$

$$10x_1^{\ -1}x_2^{\ 3}x_4^{\ -1} \le 1$$

$$x_i > 0 \quad \forall i$$

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