LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **COMPUTER SCIENCE**

FIFTH SEMESTER – APRIL 2011

# CS 5402 - OPERATIONS RESEARCH

Date : 12-04-2011 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

PART-A

Answer ALL questions 10\*2=20

1. Write the steps involved in L.P model formulation.
2. What is pivot element?
3. What is the difference between regular simplex method and the dual simplex method?
4. Define an assignment problem.
5. List out the methods of solving Transportation problem

6. What is a sequencing problem?

7. Define optimistic & pessimistic time.

1. What is dummy activity?
2. What is Holding Cost?
3. Write the formula to calculate EOQ for the system with constant demand rate.

PART-B

Answer ALL questions. 5\*8=40

11 a) A company makes two kinds of leather belts. Belt A is a high quality belt, and belt

B is of lower quality. The respective profits are Rs.4 and Rs. 3 per belt. Each belt

of type A requires twice as much time as a belt of type B, and if all belts were of

type B, the company could make 1000 per day. The supply of leathers is sufficient

for only 800 belts per day (Both A and B combined). Belt A requires a fancy buckle

and only 400 per day are available. There are only 700 buckles a day available for

belt B. Formulate the mathematical model to determine the optimal product mix .

(OR)

11 b) Solve the following L.P.P graphically.

Max Z = 10 x1 +15x2

Subject to 2 x1 +x2 ≤ 26

2 x1 +4x2 ≤ 56

- x1 +x2 ≤ 5

x1 ,x2 ≥0

12 a) Construct the dual to the primal problem

Max Z = x1 +2x2 +3x3

Subject to 3 x1 +x2 +x3 ≤ 12

x1 +2x2 +4x3 ≤ 20

2 x1 +5x2 -x3 ≤ 18

x1 ,x2,x3 ≥0

(OR)

12 b) Find an initial allocation by Vogel’s approximation method for the following transportation problem

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | D | E | F | G | Availability |
| A | 11 | 13 | 17 | 14 | 250 |
| B | 16 | 18 | 14 | 10 | 300 |
| C | 21 | 24 | 13 | 10 | 400 |
| Demand | 200 | 225 | 275 | 250 |  |

13a) Five men are available to do five different jobs. From past records, the time (in hours) that each man take to do each job is known and given in the table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Jobs | | | | | | |
| Men |  | I | II | III | IV | V |
| A | 2 | 9 | 2 | 7 | 1 |
| B | 6 | 8 | 7 | 6 | 1 |
| C | 4 | 6 | 5 | 3 | 1 |
| D | 4 | 2 | 7 | 3 | 1 |
| E | 5 | 3 | 9 | 5 | 1 |

(OR)

13 b) Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines

Task : A B C D E F G H I

Machine I : 2 5 4 9 6 8 7 5 4

Machine II : 6 8 7 4 3 9 3 8 11

14a) A project consists of a series of activities called A,B,..,I with the following

relationship<X,Y means X and Y cannot start until W is completed with this

notation construct a network diagram having the following constraints.

A<D, A<E; B<F; D<F; C<G; C<H;F<I;G<I;

Job: A B C D E F G H I

Activity:8 10 8 10 16 17 18 14 9

(days)

(OR)

14 b) (i) Write down the difference between PERT & CPM. **(4)**

(ii) Define the following terms:

a)dummy activity b) Total float **(4)**

15a) Manufacture has to supply 600 units of his product/year. Shortages are not allowed

and storage cost amounts to Rs.0.60/unit/year. The set up cost/run is Rs.80.Find the

optimum run size and the minimum average yearly cost.

(OR)

15b) A commodity is to be supplied at the rate of 200 units per day. Ordering cost is Rs.50 and the holding cost is Rs.2 per day. The delay in supply induces penalty of Rs10 per unit per delay of one day. Find the optimal policy and reorder cycle period.

PART-C

Answer ANY TWO questions 2\*20=40

16 a) Use Simplex method to solve the following L.P.P

Max Z = 5 x1 +3x2

Subject to x1 +x2 ≤ 2

5 x1 +2x2 ≤ 10

3x1 +8x2 ≤ 12

x1 ,x2 ≥0

b) Determine an initial basic feasible solution to the following transportation problem

by using (a) North west corner rule (b) Least cost method

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Destination | | | | | | |
| Source |  | D1 | D2 | D3 | D4 | Supply |
| S1 | 21 | 16 | 15 | 3 | 11 |
| S2 | 17 | 18 | 14 | 23 | 13 |
| S3 | 32 | 27 | 18 | 41 | 19 |
| Demand | 6 | 10 | 12 | 15 |  |

17 a) A marketing manager has 5 salesmen and 5 sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Salesman | Sales District | | | | |
| A | B | C | D | E |
| 1 | 32 | 38 | 40 | 28 | 40 |
| 2 | 40 | 24 | 28 | 21 | 36 |
| 3 | 41 | 27 | 33 | 30 | 37 |
| 4 | 22 | 38 | 41 | 36 | 36 |
| 5 | 29 | 33 | 40 | 35 | 39 |

What is the maximum sale that may be expected if an optimum assignment is made?

17 b)Find the sequence that minimizes the total time required in performing the following

job on three machines in order ABC .A processing time (in hours) are given in the

following table.

Jobs :1 2 3 4 5

Machine A :8 10 6 7 11

Machine B :5 6 2 3 4

Machine C :4 9 8 6 5

18a) A stockiest has to supply 12,000 units of a product per year to his customer. The

demand is fixed and known and the shortage cost is assumed is to be infinite. The

inventory holding cost is Re.0.20 per unit per month and the ordering cost per order

is Rs.350. Determine the following

(i) The optimum lot size q0

(ii) Optimum scheduling period t0

(iii) Minimum total variable yearly cost

18b) A company uses annually 24,000 units of raw material which costs Rs1.25/unit

placing each order cost Rs.22.50 and the carrying cost is 5.4%/year of the average

inventory. Find the total cost including the cost of material.

\*\*\*\*\*\*\*\*\*\*\*\*\*