B. Tech.

(SEM. VI) EXAMINATION, 2008-09

OPERATIONS RESEARCH

Time : 3 Hours]   *[Total Marks : 100*

Note :   (1)   Attempt **all** questions.

(2)   Attempt **two** parts from each question.

(3)   All questions carry **equal** marks.

(4)   Assume suitably missing data if any.

1   (a)   What is 'Operations Research' ? Describe OR Methodology with an example.

(b)   Air-Company forecasts need of air-hostess for its operations for next 4 months :

Month	April	May	June	July
Air – hostess	80	60	110	90

It needs one month training for an air-hostess to be prepared to get ready for service, during which the trainee gets Rs.6000 as

stipend. The salary of airhostess is Rs.25,000 per month. All recruitments are made on first of every month, whereas all terminations and resignations are on last date of the month. If company has to pay Rs.20,000 to air-hostess if her services are terminated; create an LPP for deciding recruitment and termination plan of the company. Today it is 28 Feb. and there are 90 air-hostesses on roll. It is observed that 10% air-hostesses leave the job of their own every month.

(c) Convert the following LPP into its dual and solve using Simplex method :

Maximize $Z = 5x_1 + 10x_2 + 8x_3$

subject to $3x_1 + 5x_2 + 2x_3 \leq 60$

$$4x_1 + 4x_2 + 4x_3 \leq 72$$

$$2x_1 + 4x_2 + 5x_3 \leq 100$$

$$x_1, x_2, x_3 \geq 0$$

2

2 (a) Optimize the following Profit Matrix for transportation using VAM. Test the optimality using stepping store algorithm :

| | Warehouse | | | |
Markets	A	B	C	Demand
Agra	32	20	17	600
Lucknow	30	16	13	600
Allahabad	40	12	18	600
Availability	700	700	700	

(b) Solve the following assignment matrix using Hangarian Algorithm (Maximization). Also write the following as an LPP :

| | Job | | | |
Person	P	Q	R	S
A	20	16	30	12
B	24	20	32	10
C	28	18	34	4
D	32	20	36	6
E	36	16	18	8

(c) There are 10 truck loads to be transported. There are 3 companies providing services. No company can provide more than 5 trucks. A company should by given at least twice load

as compared to B. Optimise the cost using DP :

Cost in Rs.

	A	B	C
1	10,000	8,000	15,000
2	18,000	14,000	25,000
3	25,000	20,000	25,000
4	31,000	28,000	25,000
5	40,000	30,000	30,000

3 (a) Holiday Homes Ltd. is planning to build a 700-room complex. It has been suggested that because existing hotel averages 70% occupancy, the new complex should have only 500 rooms. It has been estimated that cost per room per annum is Rs.21,000.

The following data are forecasted :

	No. of days	Daily Demand	Avg. Price/ Occupied room/day
Peak season	200	800	Rs.100
In between	80	600	Rs. 80
Off season	85	500	Rs. 60

Prepare :

    (i)   Pay-off table for a complex with 500, 600, 700, 800 rooms.

    (ii)   Advise Management on the no. of rooms to be included

  (b) Describe the algorithm for solution of $m \times n$ game, as an LPP.

  (c) Discuss `Saddle Point' and `Dominance Rule'. Also describe applications and limitations of `theory of games' with suitable example.

4   (a) ABC manufactures consumes 10000 kL of furnace oil per annum. The ordering cost per order is Rs.200 and carrying cost is 21% per annum. The furnace oil costs Rs.20 per ltr.

    (i)   Determine EOQ   **2+2+6**

    (ii)   Frequency of ordering

    (iii) If suppliers offer a discount of 2% if every order is for more than 2500 kL and a further discount of 1% if ordered quantity is more than 5000 ltrs, should the company avail the discount?

(b) What is `selective inventory control' ? What are various approaches of selective inventory control? Describe their application with live examples.

(c) Derive an expression for Economic run quantity. on an industry, whose intermittent product is produced at rate `P' and consumed at rate `D'. Enumerate all the assumptions used.

5 (a) The workshop operates on 8 hours basis. **2+2+3+3** Determine :

    (i) Probability that number of motors in workshop is 5

    (ii) If workshop has capacity to hold 5 motors, what should be average service time to ensure 98% probability that an incoming motor does not wait outside the workshop ?

    (iii) If service time can not be reduced in (ii), how much capacity should be provided to ensure 98% probability in (ii) ?

    (iv) What is probability, that a motor waits 2 hours before getting served ?

(b) A railway reservation office has 2 counters. The arrival of passengers is in Poisson and 8 passengers arrive per hr. It takes 10 minutes to serve a passenger (exponentially distributed). Operation of counter costs Rs.100/- per hr. and time of passenger is estimated @ Rs.400/- hr. Determine optimum no. of service counters.

(c) What is process of `Monte-Carlo Simulation' ? What are its application? Why it is preferred over mathematical models at places?

———————