

## End Semester Examination

### (PE-401) Operations Research

Programme: B .Tech (Production Sandwich

Semester I

Year: 2013-14

Duration: 3 hrs

Max. Marks:60

#### Instructions

1. Solve any six questions
2. Figures to right indicate full marks
3. Assume suitable data if required

Q.1 a A pharmaceutical company produces popular drugs A and B which are sold at the rate of Rs. 960 and Rs.780 respectively. The main ingredients are x,y and z. they are required in the following proportions 7

Drugs	X%	Y%	Z%
A	50	30	20
B	30	30	40

The total available quantities of different ingrediants are 1600 in X and 1400 in Y and 1200 in Z. the cost in Rs. Of X,Y and Z are Rs.8, RS. 6 and Rs. 4 respectively. Estimate the quantities of A and B to be produced using simplex method. Find the dual also.

b What is sensitivity analysis? Which are the conditions in which sensitivity can be useful? Enumerate three cases of sensitivity. 3

Q.2 In an investment project only 8 units of money are available for allocation in units of three investment programmes as shown the in following table. The function  $g(x)$  shows return on investment . what is the optimal investment policy? 10

x	0	1	2	3	4	5	6	7	8
$g_1(x)$	0	5	15	40	80	90	95	98	100
$g_2(x)$	0	5	15	40	60	70	73	74	75
$g_3(x)$	0	4	26	40	45	50	51	52	53

Q.3 a Solve the following game using dominance rule and find the value of the game. 5

PLAYER A	Player B			
	1	2	3	4
1	3	2	4	0
2	3	4	2	4
3	4	2	4	0
4	0	4	0	8

b Find the sequence that minimizes total time in hours required to complete the following tasks. Also find elapsed time, job waiting and machine waiting time. 5

Tasks	1	2	3	4	5	6	7	8
Time on machine A	2	7	6	7	10	3	10	12
Time on machine B	4	5	8	9	7	6	9	11
Time on machine C	5	6	4	8	3	9	11	7

Q4 Draw the network for the following project and find the project duration. What is the probability that the project can be completed in 34 days and in 26 days. 10

Activity	Proceeding Activity	Optimistic time	Most likely time	Pessimistic Time
A	C	4	6	8
B	D,E	3	5	7
C	F,G,H	4	7	9
D	I	1	3	5
E	J	6	9	11
F	I	4	6	8
G	---	2	4	6
H	K	2	3	5
I	K	5	7	9
J	K	4	5	7
K	----	3	6	8

Q5 a In a large maintenance department fitters draw parts from stores which is at present staffed by one stores man. The foreman is concerned and wants to know if the employment of a stores labourer to assist storesman would be worthwhile. Fitters cost Rs. 250 per hour Storesman cost Rs. 175 per hour and would increase the capacity of stores to 12 per hour. On an average 8 fitters visit the stores each hour. 5

- b A bakery keeps a stock of a popular brand of cake. Daily demand based on past experience is given below: 5

Daily Demand	0	15	25	35	45	55
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Simulate the demand for next 10 days

- Q.6 A project is divided into number of activities. Management is interested in finding out how much money is to be allocated so that the project can be completed in minimum number of resources The activities, durations, and manpower requirements are shown in following table 7

Activities	Duration	Manpower
1-2	4	4
1-3	5	3
2-4	4	6
2-5	6	4
3-5	9	3
4-6	3	2
5-7	9	5
6-8	7	1
7-8	2	3

- b Crashing can be a useful tool in reducing the total project duration. Explain the procedure with the help of an example with 5 activities. 3

- Q.7 a Purchase prize of a machine is Rs. 52,000. Installation charges are 14,400 maintenance charges are as follows. 5

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	3000	4000	6000	8400	11600	16000	19000

Find when the machine should be replaced

- b A factory has a large number of bulbs, all of which are to be kept in working condition. Mortality rate is given below. If a bulb is to be replaced it costs Rs. 350 to replace. If all bulbs are replaced at a time, it costs Rs. 120 each. Find the replacement policy. 5