Operation Research VTU CBCS Question Paper Set 2018

USN | | | | | | | | | | |

10AE837

Eighth Semester B.E. Degree Examination, June/July 2015

Operation Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the scope of operation Research. **(10 Marks)**

b. A firm manufactures two types of products A and B and sells them on a profit of ₹ 2 on type A and ₹ 3 on type B, each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H while type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hour 40 minutes while machine H is available for 10 hours during any working day. Formulate the problem as a linear programming problem and obtain the solution using graphical method. **(10 Marks)**

2 a. Solve the problem using simplex method

Maximize $Z = 2x_1 + 10x_2 + x_3$

Subject to $5x_1 + 2x_2 + x_3 + s_1 \le 15$

$2x_1 + x_2 + 7x_3 + s_2 \le 20$

$x_1 + 3x_2 + 2x_3 + s_3 \le 25$

$x_1, x_2, x_3 \ge 0.$ **(10 Marks)**

b. Solve the following Linear Programming problem by dual – simplex method.

Maximize $Z = 2x_1 + x_3$

Subject to $x_1 + x_2 - x_3 \ge 5$

$x_1 - 2x_2 + 4x_3 \ge 8$

$x_1 + 3x_2 + 2x_3 + s_3 \le 25$

$x_1, x_2, x_3 \ge 0.$ **(10 Marks)**

3 a. Find the intial basic feasible solution using Vogel's approximation method and then optimize by MODI method.

Destination

Origin	P	Q	R	Supply
A	5	7	8	70
B	4	4	6	30
C	3	7	7	50
Demand	65	42	43	150

(10 Marks)

b. Using the following cost matrix, determine the optimal job assignment and the cost of assignment.

Jobs

Person	J_1	J_2	J_3	J_4	J_5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

(10 Marks)

4 a. Solve the following problem using Gomory's technique. **(12 Marks)**

Maximize $Z = x_1 + 2x_2$

Subject to $x_1 + 2x_2 \leq 12$

$4x_1 + 3x_2 \leq 14$

$x_1, x_2, x_3 \geq 0$ And are integers

b. Solve the following Zero – one integer programming problem.

Maximize $Z = 3x_1 + x_2 + 3x_3$

Subject to $-x_1 + 2x_2 + x_3 \leq 4$

$4x_1 - 3x_3 \leq 2$ **(08 Marks)**

$x_1 - 3x_2 + 2x_3 \leq 3$

$x_1, x_2, x_3 = (0,1)$

PART – B

5 a. A project consists of a series or tasks labeled A, B, C, D, E, F, G, H, I with the following relationships (W < X, Y mean X and Y connot start until W is completed :X, Y < W means W cannot start until both X and Y are completed.)With this notation construct the network diagram having the following constraints.

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

Find also the optimum time of completion of the project, when the time (in days) of completion of each task is as follows :

Task :	A	B	C	D	E	F	G	H	I
Time :	23	8	20	16	24	18	19	4	10

(14 Marks)

b. Explain the basic steps, involved in PERT/CPM techniques. **(06 Marks)**

6 a. In a hair dressing saloon with one barber, the customer available follows Poisson distribution at an average rate of one every 45 minutes. The service time is exponentially distributed with a mean of 30 minutes. Find

i) Average number of customers in the saloon.

ii) Average waiting times of a customer before service.

iii) Average idle time of the barber. **(10 Marks)**

b. A super market has two sales girls brining up the sales at counters. If the service time for each customer is exponentially distributed with a mean of 4 minutes and the people arrive in Poisson distribution at counters at the rate of 10 per hour, determine all the measures of multiple server model. **(10 Marks)**

7 a. What do you mean by zero – sum game? Explain the characteristics of a game. **(08 Marks)**

b. Solve the following game with the pay off matrix

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	1	7	3	4
	A_2	5	6	4	5
	A_3	7	2	0	3

(07 Marks)

c. What are the assumptions of a Two person zero sum game. **(05 Marks)**

8 a. Use graphical method to minimize te time needed to process. The following job on machines shown. Also calculate the total time needed to complete both the jobs.

Job I	Sequence of machines	A	B	C	D	E
	Time (hrs)	3	4	2	6	2
Job II	Sequence of machines	B	C	A	D	E
	Time (hrs)	5	4	3	2	6

(12 Marks)

b. Determine the optimal sequence for the six jobs that minimizes the total elapsed time (in hrs). Also determine the idle time for each machine.

Job No.	1	2	3	4	5	6
Machine I	5	9	4	7	8	6
Machine II	7	4	8	3	9	5

(08 Marks)

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