337556(37)

B. E. (Fifth Semester) Examination, April-May/Nov.-Dec. 2020

(New Scheme)

(Mech., Production and Automobile Engg. Branch)

OPERATIONS RESEARCH

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Part (a) of each question is compulsory, solve any **one** question from (b) and (c).*

1. (a) Explain the concept of degeneracy in simplex method. 2

   (b) Solve :

   Maximize $Z = 5x_1 - 2x_2 + 3x_3$

subject to, $2x_1 + 2x_2 - x_3 \geq 2$

$3x_1 - 4x_2 \leq 3$

$x_2 + 3x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$ 18

(c) Solve following problem :

Maximize : $Z = 1000x_1 + 4000x_2 + 5000x_3$

Subject to : $3x_1 + 3x_3 \leq 22$

$x_1 + 2x_2 + 3x_3 \leq 14$

$3x_1 + 2x_2 \leq 14$

$x_1, x_2, x_3 \geq 0$ 18

2. (a) Write mathematical model for general transportation problem.   2

(b) Solve the following transporation problem where cell entries are unit costs.   18

Stores

		1	2	3	4	5	6	Supply
	1	9	12	9	6	9	10	5
Warehouse	2	7	3	7	7	5	5	6
	3	6	5	9	11	3	11	2
	4	6	8	11	2	2	10	9
Requirements		4	4	6	2	4	2	

(c) A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities 1, 2, 3, 4, 5 and 6. The distance between the cities in kilometers is shown in the matrix below. Find the assignment truck from cities in surplus to cities in deficit so that the total distance covered by vehicles is minimum.   18

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

3. (a) Define traffic intensity and balking. 2

(b) (i) In a bank operation the arrival rate is 2 customer/minute. Determine the following :

1. The average number of arrivals during 5 minutes.

2. The probability that no arrivals will occur during the next 30 seconds.

3. The probability that at least one arrival will occur during the next 30 seconds.

4. The probability that the time between two successive arrivals is at least 3 minutes. 6

(ii) The mean rate of arrival of planes at an airport during the peak period is 20/hour as per Poisson distribution. During congestion, the planes are forced to fly over the field in the stock awaiting the landing of other planes that had arrived earlier.

1. How many planes would be flying in the stack during good and bad weather?

2. How long a plane would be in the stack and

in the process of landing in good and in bad weather?

3. How much stack and landing time to allow so that priority to land out of order would have to be requested only once in 20 times? Assume $\mu = 60$ planes/hour in good weather and 30 planes/hour om bad weather. 12

(c) Estimated times for the jobs of a project are given below :

Job	A	B	C	D	E	F	G	H	I	J	K	L
time (weeks)	13	5	8	10	9	7	7	12	8	9	4	17

The constraints governing the jobs are as follows :

A and B are start jobs; A control C, D and E; B controls F and J; G depends upon C; H depends and D; E and F control I and L; K follow J; L is also controlled by K; G, H, I and L are the last jobs.

Draw the network, determine the float for each activity, project duration and the critical path. 18

4. (a) Write any four limitations of game theory. 2

(b) (i) A and B play a game in which each has three coins a 5 p a 10 p and 20 p. Each player selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, A wins B's coin; if the sum is even, B wins A's coin; find the best strategy for each player and the value of the game.   6

(ii) Solve the following game by graphical method. 12

B

	y_1	y_2	y_3	y_4
x_1	19	6	7	5
A x_2	7	3	14	6
x_3	12	8	18	4
x_4	8	7	13	-1

(c) (i) List (a) the advantages (b) the applications and (c) the limitations of simulation.   6

(ii) Two persons 'X' and 'Y' work on a two-patt assembly line. The distribution of activity times at their stations are :

Time in seconds	Time frequency for X	Time frequency for Y
10	4	2
20	7	3
30	10	6
40	15	8
50	35	12
60	18	9
70	8	7
80	3	3

(A) Stimulate operation of the line for eight items.

(B) Assuming 'Y' must wait until 'X' completes the first item before starting work, will he have to wait to process any of the other seven items? What is the average waiting time of items for Y.

Use the following random numbers :

For X 83   70   06   12   59   46   54   04

For Y 51   99   84   81   15   36   12   54

(C) Determine the inventory of items between the two stations.

(D) What is the average production rate.   12