

- N.B. :** 1) Attempt any one question. from Section I any ONE from Section -II.
 2) Figures to the right indicate marks.
 3) Graph papers and statistical table will be provided on request.

Section-I

- Q.1 a)** Solve the following Linear programming problem by graphical method. 5

$$\text{Min } Z = \frac{3}{2}x - \frac{5}{2}y$$

Subject to $x + 3y \geq 3$
 $x + y \geq 2.$
 $x, y \geq 0.$

- b) Determine initial feasible solution by using Vogel's approximation method and test for the optimally. 6

destination supplier	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	19	30	50	10	7
S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Demand	5	8	7	14	

- c) Write dual for the following Simplex problem : 4

Max. $Z = 6x_1 + 8y_1 + 2z_1$
 Subject to
 $30x_1 + 20y_1 + 10z_1 \leq 300$
 $5x_1 + 10y_1 + 7z_1 \leq 100$
 $12x_1 - 8y_1 + 5z_1 \leq 225$
 $x_1, y_1, z_1 \geq 0.$

- Q.2 a)** Solve the following Linear programming problem by simplex method. 6

Max $z = 5x_1 + 3x_2$
 subject to $3x_1 + 5x_2 \leq 15$
 $5x_1 + 2x_2 \leq 10$
 $x_1, x_2 \geq 0.$

- b) Determine initial feasible solution to the following transportation problem by using i) North West Corner rule ii) Least cost method iii) Vogel's approximation method. 6

		Destination				
Supply	D ₁	D ₂	D ₃	D ₄	Supply	
S ₁	21	16	15	3	11	
S ₂	17	18	14	23	13	
S ₃	32	27	18	41	19	
Demand	6	10	12	15		

- c) Food I contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and cost 12 paise per gram. Food II contains 8 units of vitamin A per gram and 12 units of vitamin B per gram. The daily minimum requirement of vitamin A and vitamin B are 400 and 480 units respectively. Formulate the linear programming in order to minimise the cost of the mix of these product. 3

Section -II

- Q.3 a) A solicitor firm employees typist on hourly piece rate basis for their daily work. There are five typist and five jobs, the charges and speed of the typist are different given by the following data. One typists is given only one job and vice a versa. Find the least allocation for the following data. 5

Typist jobs	P	Q	R	S	T
A	85	75	65	125	75
B	90	78	66	132	78
C	75	66	57	114	69
D	80	72	60	120	72
E	76	64	56	112	68

- b) We have 7 jobs each of which has to go through machine M₁ and M₂ in the order M₁, M₂. The processing time in hours are given as follows. 4

Jobs	1	2	3	4	5	6	7
M ₁	3	12	15	6	10	11	9
M ₂	8	10	10	6	12	1	3

Determine the order in which the jobs should be processed to minimise the total elapsed time. Find idle time for each machine.

- c) Draw an arrow diagram for the following project Find i) earliest start ii) Latest finish
 a) critical path iv) Total float, free and independent float.

Additivity	:	1-2	1-3	1-4	2-5	3-6	3-7	4-6	
duration	:	2	2	1	4	8	5	3	
Activity	:	5-8	6-9	7-8	8-9				
duration	:	1	5	4	3				6

- Q.4 a) Five different machines can do any of the five required jobs with different profits resulting from each assignment has shown below :

		Machines				
Jobs		A	B	C	D	E
	1	30	37	40	28	40
	2	40	24	27	21	36
	3	40	32	23	30	35
	4	25	28	40	36	36
	5	29	62	41	34	39

Find the maximum profit possible through assignment. 5

- b) Find the sequence that minimise total elapsed time required to complete following :
 task on two machines. Also find total minimum elapsed time and ideal time for
 each machine.

Task	A	B	C	D	E	F	G	H	I
M _I :	2	5	4	9	6	8	7	5	4
M _{II} :	6	8	7	4	3	9	3	8	11

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- c) A project is represented by the network shown below and has the following date.

Task :	A	B	C	D	E	F	G	H	I
Optimistic Time :	5	18	26	16	15	6	7	7	3
Pessimistic time :	10	22	40	20	25	12	12	9	5
Most likely time :	8	20	33	18	20	9	10	8	4

Determine the following

- i) Draw and arrow diagram ii) Find earliest start and Latest finish
 iii) Find the critical path and iv) Find the probability that the project will be
 completed before 41.5 days ? 6
