



ZUSN

AY12EE407

10EE661

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Operations Research

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.**
2. Use of Normal Distribution tables is permitted.

PART – A

- 1 a. ABC Farms uses atleast 800 kg of special feed daily. The special feed is a mixture of Corn and Soyabean meal with the following compositions :

Feedstuff	Kg per Kg of feedstuff		Cost per Kg
	Protein	Fiber	
Corn	0.09	0.02	30
Soyabean	0.60	0.06	90

The dietary requirements of the special feed are atleast 30% protein and atmost 5% fiber. The goal is to find minimum-cost feed mix.

- (i) Formulate as LPP and (ii) solve graphically and find optimum solution. (12 Marks)
- b. Solve the following LPP by Simplex method.
Max. $Z = 3x_1 + 5x_2$
Subject to $x_1 \leq 4$; $2x_2 \leq 12$; $3x_1 + 2x_2 \leq 18$
 $x_1 \geq 0$ and $x_2 \geq 0$ (08 Marks)
- 2 a. Solve the following the Simplex and State the nature of solution.
Max. $Z = x_1 + 2x_2$
Subject to $x_1 - x_2 \leq 10$;
 $2x_1 \leq 40$ and $x_1, x_2 \geq 0$ (06 Marks)
- b. Solve the following by Big-M method to prove that the LPP has no feasible solution.
Max. $Z = 3x_1 + 2x_2$
Subject to $2x_1 + x_2 \leq 2$
 $3x_1 + 4x_2 \geq 12$ and $x_1, x_2 \geq 0$ (08 Marks)
- c. Write the dual for the following primal
Max. $Z = 5x_1 + 6x_2$
Subject to $x_1 + 2x_2 = 5$
 $-x_1 + 5x_2 \geq 3$
 $4x_1 + 7x_2 \leq 8$
 x_1 unrestricted and $x_2 \geq 0$ (06 Marks)
- 3 a. Explain in brief the steps involved in 'Revised Simplex method'. (08 Marks)
- b. Solve the following by Dual Simplex method.
Min. $Z = 3x_1 + 2x_2 + x_3$
Subject to $3x_1 + x_2 + x_3 \geq 3$
 $-3x_1 + 3x_2 + x_3 \geq 6$
 $x_1 + x_2 + x_3 \leq 3$
 $x_1, x_2, x_3 \geq 0$ (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 A Solicitor's firm employs typists on hourly piece-rate basis for their daily work. There are five typists and their charges and speed are different. Only one job is given to one typist and the typist is paid for a full hour even if the work needs a fraction of an hour. Find the least cost allocation for the following data:

Typist	Rate per hour	Speed of Typing No. of Pages/hour	Job	No. of pages to be typed
A	5	12	P	200
B	6	14	Q	175
C	3	8	R	145
D	4	10	S	298
E	4	11	T	178

(20 Marks)

PART - B

- 5 a. Write a brief note on 'Degeneracy in Transportation Problem'. (05 Marks)
b. Solve the following transportation problem.

		Per unit Profit				Availability at warehouses
		Market				
		A	B	C	D	
Warehouse	X	12	18	6	25	200
	Y	8	7	10	18	500
	Z	14	3	11	20	300
Demand in Market (units)		180	320	100	400	

(15 Marks)

- 6 a. Define (i) Two Person Zero Sum game
(ii) Game Value
(iii) Saddle Point
(iv) Pay-off matrix (08 Marks)
b. Solve the following game graphically

		B			
		B ₁	B ₂	B ₃	B ₄
A	a ₁	8	5	-7	9
	a ₂	-6	6	4	-2

(12 Marks)

- 7 A project consists of nine activities whose time estimates (in weeks) and precedence relationship are given below:

Activity	Preceding activity	Time (weeks)		Most
		Most optimistic	Most likely	Pessimistic
A	-	2	4	6
B	-	6	6	6
C	-	6	12	24
D	A	2	5	8
E	A	11	14	23
F	B, D	8	10	12
G	B, D	3	6	9
H	C, F	9	15	27
I	E	4	10	16

- a. Construct PERT network.
- b. What is the expected project completion time?
- c. Identify the critical activities.
- d. What is the probability of completing the project one week before the expected time?
- e. A penalty of Rs. 15000 per week is to be imposed on the contractor if the project is not completed in 36 weeks. What is the probability that he has to pay a penalty of Rs.45,000.

(20 Marks)

- 8 a. The data on the operating costs per year and resale prices of equipment whose purchase price is Rs.10,000 are given here below:

Year	1	2	3	4	5	6	7
Operating cost (Rs.)	1500	1900	2300	2900	3600	4500	5500
Resale value (Rs.)	5000	2500	1250	600	400	400	400

What is the optimum period for replacement?

(12 Marks)

- b. Write a brief note on 'Replacement policy of items that fail suddenly'.

(08 Marks)

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