

**CONCURRENT EVALUATION****III SEM / STRATEGIC MANAGEMENT (302)****Faculty Name: Dr. Aditi Markale****Important Instructions:**

1. The subject is evaluated on the basis of **three** components

<b>Component Number</b>	<b>Component</b>	<b>Marks</b>	<b>Submission Date</b>
1	Written Home Assignment	50	20 April 2022
2	Written Home Assignment	50	20 April 2022
3	Exam	50	

2. Assignments to be submitted in person.
3. Student Name, contact number, email-id, Specialization, Component must be clearly mentioned
4. **SOLVE ANY 5 from each component.**

**COMPONENT 1: Written Home Assignment**

**Note: Solve Any 5**

1. Determine the optimum shipping cost for the following transportation problem.

Distribution centre	Retails outlet					Availability
Agra	55	30	40	50	40	
Allahabad	35	30	100	45	60	
Calcutta	40	60	95	35	30	
Requirement	5	2	4	6	3	

2. The wholesale company has three warehouses from which supplies are drawn for four retail customers. The company deals in a single product. The supplies of which at each warehouse are.

Warehouse no.	Supply( units)	Customer No.	Demand units
1	20	1	15
2	28	2	19
3	17	3	13
		4	18

Conveniently total supply at the ware houses is equal to total demand from the customer. The following table gives the transportation costs per unit shipment from each ware house to each customer.

Ware house	Customer			
	1	2	3	4
1	3	6	8	5
2	6	1	2	5
3	7	8	3	9

Determine the allocation to minimize overall transportation cost.

3. Find the initial basic feasible solution of the following transportation problem using
- North west corner method.
  - Matrix minimum method.
  - Vogel's approximation method.

Also find corresponding costs.

Factory	Warehouse				Capacity units
	A	B	C	D	
X	11	31	51	11	7
Y	71	31	41	61	9
Z	41	09	71	21	18
Requirement Unit	05 08		07	15	

4. Solve the following T. P.

Unit Transportation Cost (Rs.)

Factory	Warehouses			Capacity
	D	E	F	
A	5	1	7	10
B	6	4	6	80
C	3	2	5	15
Requirement	75	20	50	

5. Goods have to be transported from sources S<sub>1</sub>, S<sub>2</sub> & S<sub>3</sub> to destinations D<sub>1</sub>, D<sub>2</sub> & D<sub>3</sub>. The transportation cost per unit, capacities of the sources, and the requirements of the destinations are given in the following table. Determine a transportation schedule so that cost is minimised.

Supply	Demand			
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	
S <sub>1</sub>	8	5	6	120
S <sub>2</sub>	15	10	12	80
S <sub>3</sub>	3	9	10	80
	150	80	50	

6. A department of a company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix.

Jobs	Employees				
	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man-hours.

7. A company operates in four territories, and four salesman available for an assignment. The territories are not equally rich in their sales potential. It is estimated that a typical salesman operating in each territory would bring in the following annual sales:

Territory :	I	II	III	IV
Annual Sales (Rs):	126000	105000	84000	63000

The four salesmen also differ in their ability. It is estimated that, working under the same conditions, their yearly sales would be proportionately as follows:

Salesmen :	A	B	C	D
Proportion:	7	5	5	4

If the criterion is maximum expected sales, the intuitive answer is to assign the best salesman to the richest territory, the next best salesman to the second richest, and so on; verify this answer by the assignment technique.

8. Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and is given in the following table:

		Jobs				
		I	II	III	IV	V
Men	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find out how men should be assigned the jobs in way that will minimize the total time taken.

9. A company has 4 machines on which to do 3 jobs. Each job can be assigned to one and only one machine. The cost of each job assignments for minimum cost?

Job	Machine			
	W	X	Y	Z
A	17	23	27	31
B	7	12	16	18
C	9	14	18	21

A pharmaceutical company producing a single product sold it through five agencies situated in different cities. All of a sudden, there rouse a demand for the product in another five cities that didn't have any agency of the company. The company is now facing the problem of deciding on how to assign the existing agencies in order to despatch the product to needy cities in such a way that the travelling distance is minimized. The distance between the surplus and deficit cities (in km) is given in the following table.

	Deficit cities				
	a	b	c	d	e

Surplus Cities	A	160	130	115	190	200
	B	135	120	130	160	175
	C	140	110	125	170	185
	D	50	50	80	80	110
	E	55	35	80	80	105

10. A national truck rental service has a surplus of one truck in each of the cities, 1, 2, 3, 4, 5 & 6 and a deficit of one truck in each of the cities 7, 8, 9, 10, 11 & 12. The distances (in km) between the cities with a surplus and cities with deficit are displayed in the table below:

		To					
		7	8	9	10	11	12
From	1	31	62	29	42	15	41
	2	12	19	39	55	71	40
	3	17	29	50	41	22	22
	4	35	40	38	42	27	33
	5	19	30	29	16	20	23
	6	72	30	30	50	41	20

11. Following table gives profits matrix for different events & actions. Calculate EVPI

Events (States of Nature)	Probability	Actions		
		A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>
E <sub>1</sub>	0.20	40	52	45
E <sub>2</sub>	0.35	70	28	40
E <sub>3</sub>	0.35	30	70	-50
E <sub>4</sub>	0.10	30	-50	-70

12. A certain output is manufactured at Rs. 8 and sold at Rs. 14 per unit. The product is such that if it is produced but not sold during a day time it becomes worthless. The daily sales records in the past are as follows.

Demand per day:	30	40	50	60	70
No. of days each sales level was recorded:	24	24	36	24	12

- Calculate the average expected sales of a day.
- Find the expected pay-offs and the optimum policy.
- Also find the value of perfect information.

13. The Probability distribution of demand for cakes is given below:

No. of Cakes demanded (in arbitrary units)	0	1	2	3	4	5
Probability	0.05	0.10	0.25	0.30	0.20	0.10

If the cost per cake is Rs. 3 per unit & selling price is Rs. 4 per unit, how many cakes should the baker make to maximise his profit. Assume that if cake is not sold at the end of the day its value is zero.

14. A farmer wants to decide which of the 3 crops he should plant. The farmer has categorised the amount of rainfall is high, medium & low.

Estimated profit is given below.

Rainfall	Estimated Profit ( inRs.)		
	Crop A	Crop B	Crop C
High	8,000	3,500	5,000
Medium	4,500	4,500	4,900
Low	2,000	5,000	4,900

Farmer wishes to plant one crop, decide the best crop using:

- Hurwicz criteria (take degree 0.6)
- Laplace criteria
- Minimax regret criteria.

15. The past experience shows that the number of copies of a book in demand are between 25 & 30 copies. Some agency purchases such unsold copies for Rs. 35. The vendor purchases the copies at Rs. 83 each & sales them at Rs. 110 each.

Find the number of copies to be kept in stock using EMV criteria if probability of demand are known as:

Demand	25	26	27	28	29	30
Probability	0.05	0.10	0.30	0.32	0.16	0.07

16. The manager of a flower shop promises its customers delivery within four hours on all flower orders. All flowers are purchased on the previous day and delivered to Parker by 8.00 am the next morning. The daily demand for roses is as follows.

Dozens of roses:	70	80	90	100
Probability :	0.1	0.2	0.4	0.3

The manager purchases roses for Rs.10 per dozen and sells them for Rs.30. All unsold roses are donated to a local hospital. How many dozens of roses should Parker order each evening to maximize its profit? What is the optimum expected profit?

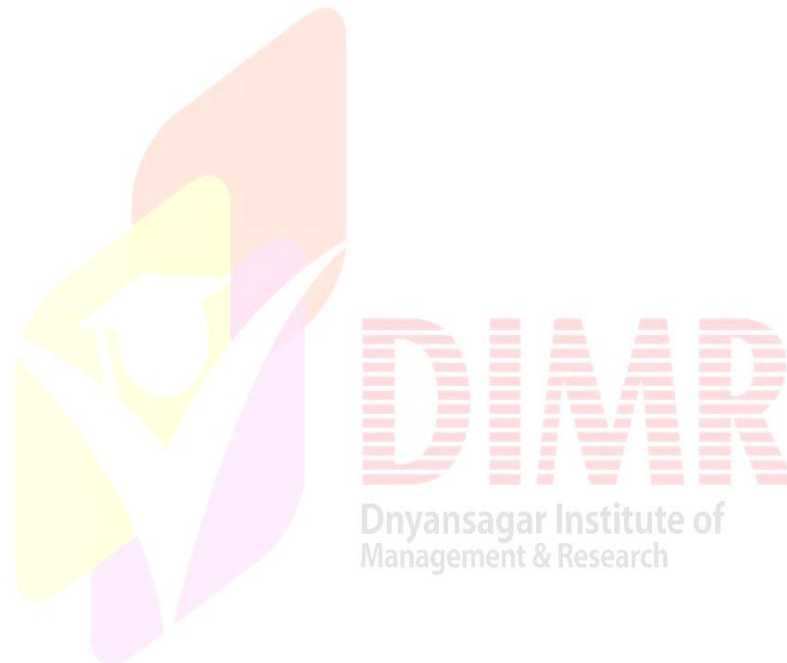
17. The activities of a project with details are as given bellow

Activity	Predecessor Activity	to	tm	tp
A	-	6	7	8
B	A	5	7	9
C	B	1	2	3
D	B	6	7	8
E	B	3	5	7
F	C	2	4	6

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G	D	4	6	14
H	F	5	7	9
I	E,G,H	1	2	9

- Draw Network Diagram.
- Find project duration & identify critical path
- Calculate EST, EFT, LST, and LFT & Float for each activity.



**COMPONENT 2: Written Home Assignment**
**Note: Solve Any 5**

- Production of a certain chemical mixture should contain minimum 80 mg chlorides, 28 mg nitrates and 36 mg of sulphate per kg. The company can use two substances. Substance X contains 8 mg chlorides, 4 mg nitrates and 6 mg sulphates per gram. Substance Y contains 10 mg chloride, 2 mg Sulphates per gram. Both substances cost Rs. 20 per gram. It is required to produce the mixture using substances X and Y so that the total cost is minimum. Formulate the problem as LPP.
- A firm uses lathes, milling and grinding machines to produce two machine parts. Table given below represents times available on different machines and profits on each machine part.

Type of machine	Machining time required for machine part in minutes		Maximum time available in minutes
	I	II	
Lathes	12	6	3000
Milling	4	10	2000
Grinding	2	3	900
Profit per unit Rs.	40	100	

Find the number of parts I and II to be manufactured per week to maximize the profit.

- Consider a small plant which makes two types of automobile parts, say A & B. it buys castings that are machined, bored & polished. The capacity of machining is 25 per hour for A & 24 per hour for B, capacity for boring is 28 per hour for A and 35 per hour and the capacity of polishing is 35 per hour for A and 25 per hour for B. castings for part A cost Rs. 2 and sell for Rs. 5 each and those for part B cost Rs. 3 and sell for Rs. 6 each. The three have running costs of Rs. 20, Rs. 14 & Rs. 17.50 per hour. Assuming that any combination of parts A & B can be sold. Formulate & solve this problem as an LPP to determine the optimum product mix & maximum profit.
- A refinery makes 3 grades of petrol A, B and C from crude oils D, E and F. Crude oil F can be used in any grade but the others must satisfy the following specifications.

Grade	Selling Price per Litre (Rs)	Specifications
A	Rs. 48	Not less than 50% crude D Not more than 25% crude E
B	Rs. 50	Not less than 25% crude D Not more than 50% crude E
C	Rs. 49	No Specifications

There are capacity limitations on the amounts of 3 crude elements than can be used

Crude	Capacity (KL)	Price per Litre (Rs.)
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D	500	49.5
E	500	47.5
F	360	48.5

Formulate LPP to maximize Profit.

5. A manufacturing company is engaged in producing three types of products: A, B & C. The production department produces, each day, components sufficient to make 50 units of A, 25 units of B & 30 units of C. The management is confronted with the problem of optimizing the daily production of the products in the assembly department, where only 100 man-hours are available daily for assembling the products. The following additional information is available:

Type of Product	Profit Contribution per Unit of Product (Rs.)	Assembly Time per Product (Hrs.)
A	12	0.8
B	20	1.7
C	45	2.5

The company has a daily order commitment for 20 units of products A and a total of 15 units of products B & C. Formulate this problem as an LP model so as to maximize the total profit.

6. A company has two grades of inspectors 1 & 2, the members of which are to be assigned for a quality control inspection. It is required that at least 2000 pieces be inspected per 8-hour day. Grade 1 inspectors can check pieces at the rate of 40 per hour, with an accuracy of 97 percent. Grade 2 inspectors check at the rate of 30 pieces per hour with an accuracy of 95 percent. The wage rate of a Grade 1 inspector is Rs. 5 per hour while that of Grade 2 inspector is Rs. 4 per hour. An error made by an inspector costs Rs. 3 to the company. There are only 9 Grade 1 inspectors and 11 Grade 2 inspectors available to the company. The company wishes to assign work to the available inspectors so as to minimize the total cost of the inspection. Formulate this problem as an LP model so as to minimize the daily inspection cost.

7. Use the graphical method to solve the following LP problem.

$$\text{Maximize } Z = 7x_1 + 3x_2$$

$$\text{Subject to the constraints: } \begin{aligned} x_1 + 2x_2 &\geq 3 \\ x_1 + x_2 &\leq 4 \\ x_1 &\leq 2.5 \\ x_2 &\leq 1.5 \\ x_1, x_2 &\geq 0 \end{aligned}$$

8. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution with an approximate average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?
9. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate:

- a). Expected queue size (line length).
- b). Probability that the queue size exceeds 10.

If the input of trains increases to an average of 33 per day, what will be the change in a & b.

10. Arrivals at telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone calls is assumed to be distributed exponentially, with a mean of 3 minutes.
- a). What is the probability that a person arriving at the booth will have to wait?
  - b). The telephone department will install a second booth when convinced that an arrival would expect waiting for at least 3 minutes for a phone call. By how much should the flow of arrivals increase in order to justify a second booth?
  - c). What is the average length of the queue that forms from time to time?
  - d). What is the probability that it will take a customer more than 10 minutes altogether to wait for the phone and complete his call?
11. A warehouse has only one loading dock manned by a three person crew. Trucks arrive at the loading dock at an average rate of 4 trucks per hour and the arrival rate is Poisson distributed. The loading of a truck takes 10 minutes on an average and can be assumed to be exponentially distributed. The operating cost of a truck is Rs 20 per hour and the members of the loading crew are paid Rs 6 each per hour. Would you advise the truck owner to add another crew of three persons?

**COMPONENT 3: EXAM**  
**Exam for all units.**