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Roll No. :

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**M. B. A (Fourth Semester) Examination,
April-May 2021**

(New Scheme)

(Management Branch)

ECONOMETRICS and DECISION SCIENCE

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 32

***Note : Instruction are given separately in each unit.
Attempt all units.***

Unit-I

both

Note : Solve (a) and (b) or (c) only.

- 1. (a) What is Input-Output Analysis? Explain its assumptions, uses and limitations.**

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(b) Discuss the methodology of Econometrics in details. How it is useful in business decision dilemmas. 8

(c) An economy produces only coal and steel. The two commodities serve as intermediate input in each other's production. 0.4 tonne of steel and 0.7 tonne of coal are needed to produce a tonne of steel, similarly 0.1 tonne of steel and 0.6 tonne of coal are required to produce a tonne of coal. No capital inputs are needed. Do you think that the system is viable?

2 and 5 labour days are required to produce a tonne of coal and steel, respectively. If the economy needs 100 tonnes of coal and 50 tonne of steel, calculate the gross output of the two commodities and total labour required.

Determine the equilibrium prices and value added, if the wage rate is Rs. 10 per hour. 16

Unit-II

Note : Solve (a) and (b) or (c) only. and (d)

2. (a) What is game theory? State the assumptions of game theory. Discuss its importance to business decisions. 8

(b) The management of a corporation is in the process

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of deciding whether to agree to negotiate with the striking union now or delay. The decision is difficult because the management does not know the union leadership's position. The union leaders may be adamant and insist on their original demands, they may be ready to compromise or they may be ready to yield and accept the original management offer. The matrix of pay-offs to management, as management sees it, is (in Rs 1 million units).

		Union position		
		B1 Adamant	B2 Compromise	B3 Yield
Management	A1 Negotiate	-2	1	2
	A2 Delay	5	-2	-3

What should be the management's strategy and union's strategy? Also find game value. 8

(c) Solve the following zero-sum game. 8

Player A		Player B				
		B1	B2	B3	B4	B5
A1	2	-4	6	-3	5	
A2	-3	4	-4	1	0	

(d) Two competitors are competing for the similar product. The pay-off matrix in terms of their advertising plan is show below. Find the optimal strategies and the value of the game. 8

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		Competitor B		
		Large Advt.	Medium Advt.	Small Advt.
Competitor A	Large Advt.	70	80	50
	Medium Advt.	90	60	95
	Small Advt.	105	90	65

Unit-III

Note : Solve (a) and (b) or (c) only and d

3. (a) Suppose that new razor blades were introduced in the market by three companies at the same time. When they were introduced, each company had an equal share of the market, but during the first year the following changes took place:

- Company A retained 90 percent of its customers, lost 3 percent to B and remaining to C.
- Company B retained 70 percent of its customers, lost 10 percent to A and remaining to C.
- Company C retained 80 percent of its customers, lost 10 percent to A and remaining to B.

Assuming that no changes in the buying of the consumer occur.

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- What are the market shares of the three companies at the end of first year and the second year?
 - What are the long run market share of the three companies?
- (b) In a city, only two brands of cola are sold: AA and BB. If a buyer bought cola AA last time, there is 0.75 chance that he would buy the same cola in the next purchase. Similarly, it is known that if a buyer bought brand BB last time, the probability for him to buy the brand AA next time is 0.4.
- Using this information, develop the transition probability matrix.
 - Find the probability that a customer, who is currently cola AA purchaser, shall take cola BB in the next-to-next purchase.
- (c) What do you understand by Markov Process? In what areas of management can they be applied successfully?
- (d) A researcher is analyzing brand switching between different airlines, operating on the Delhi-Mumbai route by frequent fliers. On the basis of the data collected by her, the researcher has developed the

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following transition probability matrix:

		To Airline		
		AA	BB	CC
From Airline	AA	0.90	0.03	0.07
	BB	0.15	0.80	0.05
	CC	0.20	0.30	0.50

It is found that currently the airlines AA, BB and CC have 20%, 50% and 30% market respectively.

- Obtain the market share for each airline in two months' time.
- Calculate the long run market share for each airline assuming frequent fliers make two flights in a month.

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Unit-IV

Note : Solve (a) and (b) or (c) ~~only~~. (d)

- Describe various decision environments with suitable examples.
 - The research department of Hindustan Lever has recommended the marketing department to launch a shampoo of three different types. The marketing manager has to decide one of the types of shampoo to be launched under the following estimated pay-offs (in millions of Rs) for various levels of sales:

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Estimated level of Sales (units)

Types of Shampoo	15000	10000	5000
Egg Shampoo	30	10	10
Clinic Shampoo	40	15	5
Deluxe Shampoo	55	20	3

What will be the marketing manager's decision if (i) Maximin, (ii) Maximax, (iii) Laplace and (iv) Regret Criterion is applied?

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- A physician purchases a particular vaccine on Monday of each week. The vaccine must be used within the week following, otherwise it become worthless. The vaccine costs Rs. 20 each dose and the physician charges Rs. 60 per dose. In the past 50 weeks, the physician has administered the vaccine in the following questions:

No. of Doses	20	25	40	60
No. of Weeks	5	15	25	5

- Draw up a payoff matrix.
- Obtain a regret matrix.
- Determine the optimum number of doses the physician should buy.
- The maximum amount the physician would

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be willing to pay per week for a perfect information about the number of doses expected to be demanded in a week.

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- (d) A businessman has two independent investments A and B available to him, but he lacks the capital to undertake both of them simultaneously. He can choose to take A first and then B, or if A is successful then take B, or vice versa. The probability of success on A is 0.7, while for B it is 0.4. Both investments require an initial capital outlay of Rs. 2000, and both return nothing if the venture is unsuccessful. Successful completion of A will return Rs. 3000 (over cost), successful completion of B will return Rs. 5000 (over cost). Draw the decision tree and determine the best strategy.

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Unit-V

both

Note : Solve (a) and (b) or (c) only.

5. (a) What is simulation? Describe Monte Carlo Simulation. What are the advantages and disadvantages of simulation?
- (b) A bakery keeps stock of a popular brand of cakes. Previous experience shows the daily demand pattern

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for the item with associated probabilities, as given :

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Daily Demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days. Also find out the average demand per day.

Random Number: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

- (c) A small retailer has studied the weekly receipts and payment over past 200 weeks and has developed the following set of information:

Weekly Receipts	Probability	Weekly Payments	Probability
3000	0.20	4000	0.30
5000	0.30	6000	0.40
7000	0.40	8000	0.20
12000	0.10	10000	0.10

Using the following sequence of random numbers:

For Receipts : 03, 91, 38, 55, 17, 46, 32, 43, 69, 72, 24, 22

For Payments: 61, 96, 30, 03, 32, 88, 48, 28, 88, 18, 71, 99

- (i) Simulate the weekly pattern of receipts and payments for the 12 weeks of the next quarter, assuming further that the beginning

bank balance is Rs. 8000.

- (ii) What is the estimated balance at the end of the 12 weeks period?
- (iii) What is the highest weekly balance during the quarter?
- (iv) What is the average weekly balance for the quarter.

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Weekly Payments	Weekly Receipts	Weekly Balance
1000	1000	0.00
1500	1000	0.50
2000	1000	1.00
2500	1000	1.50
3000	1000	2.00