K24P 3864

Reg. No. : .....

Name : .....

I Semester M.Com. Degree (C.B.C.S.S. – O.B.E. – Reg./Supple./Imp.) Examination, October 2024
(2023 Admission Onwards)
CMCOM 01C02 : QUANTITATIVE TECHNIQUES AND OPERATIONS RESEARCH

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **any five** questions. **Each** question carries **three** marks. **(5×3=15)**

1. Explain the methodology for simulation process.
2. What are the features of a binomial distribution ?
3. A single card is chosen at random from a standard deck of 52 playing cards. What is the probability of choosing a king or a club ?
4. What is meant by Jockeying, Balking and Reneging ?
5. State the multiplication theorem of probability.
6. What are the time estimates used in PERT ?

SECTION – B

Answer **any three** question. **Each** question carries **five** marks. **(3×5=15)**

7. Differentiate PERT and CPM.
8. Explain different phases of Operations Research.
9. Solve the following assignment problem to get maximum profit.

		Machines			
		A	B	C	D
Job	1	35	27	28	37
	2	28	34	29	40
	3	35	24	32	28
	4	24	32	25	28

P.T.O.

10. A box contains 5 black, 7 red and 6 green balls. Three balls are drawn from this box one after the other without replacement. What is the probability that the three balls are
    1) all black balls
    2) of different colours
    3) two black and one green black ?

11. Draw a network diagram for the project whose activities and their predecessor relationships are given below :

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor Activity	–	–	–	A	B	B	C	D	F	H, I	F, G

SECTION – C

Answer **any three** questions. **Each** question carries **ten** marks. **(3×10=30)**

12. A company has three production facilities S1, S2 and S3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D1, D2, D3 and D4 with requirement of 5, 8, 7 and 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below :

	D1	**D2**	**D3**	**D4**	**Supply**
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

Minimize the total transportation cost. Use North-West Corner Method (NWCM) to find an initial basic feasible solution.

13. In a certain neighbourhood,90% of children fell ill due to the flu and 10% due to measles, with no other diseases reported. The probability of observing rashes for measles is 0.95 and for the flu is 0.08. If a child develops rashes, find the probability of the child having the flu.

14. A project consists of seven activities with the following time estimates. Find the probability that the project will be completed in 30 weeks or less.

Activity	Predecessor Activity	Optimistic time estimate (days)	Most likely time estimate (days)	Pessimistic time estimate (days)
A	–	2	5	8
B	A	2	3	4
C	A	6	8	10
D	A	2	4	6
E	B	2	6	10
F	C	6	7	8
G	D,E,F	6	8	10

15. Consider the problem of assigning four sales persons to four different sales regions as shown below such that the total sales are maximized.

		Sales Region			
		1	2	3	4
Sales person	A	5	11	8	9
	B	5	7	9	7
	C	7	8	9	9
	D	6	8	11	12

The cell entries represent annual sales figures in crores of rupees. Find the optimal allocation of the salespersons to different regions.

16. Define the following:
    a) Trial
    b) Event
    c) Mutually exclusive event
    d) Exhaustive event
    e) Independent event.

    Also explain different schools of thought on probability.

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SECTION – A

Answer **any five** questions. **Each** question carries **three** marks.

1. Explain Addition and Multiplication theorems of Probability.
2. State the properties of normal distribution.
3. Explain different types of 'floats' in network analysis.
4. A candidate is invited for an interview for three posts. If there are 3, 4 and 2 applicants for first, second and third post respectively, what is his chance of getting at least one post ?
5. Brief the procedure of solving LPP by graphical method.
6. What do you mean by Game theory ? **(5×3=15)**

SECTION – B

Answer **any three** questions. **Each** question carries **five** marks.

7. In a class, 30% of students have failed in Accounting, 20% of the students have failed in Banking and 10% have failed in both Accounting and Banking. If a student is selected at random;
   a) What is the probability that the student has failed in Accounting, if it is known that he has failed in Banking ?
   b) What is the probability that the student has failed in Accounting or in Banking ?

P.T.O.

8. A student want to apportion his available time of about 10 hours a day between study and play. He considers play is twice as much fun as study. He also wants to study at least as much as he plays. However, he realizes that if he is going to get all his homework done, he cannot play more than 4 hours a day. Formulate an LPP so as to allocate his time to maximize his pleasure from both study and play.

9. The following table gives the number of road accidents happened in a city during a period of 50 days.

No. of accidents	0	1	2	3	4
No. of days	19	18	8	4	1

Fit a Poisson distribution.

10. Explain various steps involved in solving transportation problem under Vogel's Approximation Method.

11. Briefly explain the application and scope of operations research in business.

(3×5=15)

SECTION – C

Answer **any three** questions. **Each** question carries **ten** marks.

12. A company has four plants A, B, C and D each of which can produce any one of the four products 1, 2, 3 and 4. Production costs and sales revenue differ from one plant to another. From the data given below, find which product each plant should produce to maximize profit using assignment technique.

Plant	**Sales Revenue (Rs.)**				**Production Cost (Rs.)**			
	Product 1	**Product 2**	**Product 3**	**Product 4**	**Product 1**	**Product 2**	**Product 3**	**Product 4**
A	65	78	83	85	33	40	43	45
B	85	52	59	73	45	28	31	37
C	83	56	69	78	42	29	36	41
D	49	80	85	73	27	42	44	37

13. For the manufacture of a product two raw materials A and B are used. Each unit of A and B weighs 5 and 10 grams respectively. One unit of finished product must weigh exactly 150 gms. A costs Rs. 2 per unit and B costs Rs. 8 per unit. Not more than 20 units of A and at least 14 units of B must be used.

    How much of each type of raw material should be used for each unit of the finished product in order to minimize the cost ? Use simplex method.

14. Construct a network diagram from the following activity sequence of project. Find critical path and total duration of the project.

Activity	Immediate Predecessor	Duration in Weeks
A	–	4
B	–	7
C	–	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

15. The time taken by a team of workers of construction company to complete a small project is a normal variate with mean 400 labour hours and SD of 100 labour hours.

    a) Find the probability that the project completed within 350 to 450 labour hours.

    b) If the company assures the completion of the project in 450 labour hours or less and agrees to pay a penalty of Rs. 100 each labour hour spent in excess of 450, find the probability that the company pays a penalty of at least Rs. 2,000.

16. Define an Operations Research model. Briefly explain different types of models used in Operations Research. **(3×10=30)**