

Question Paper

Exam Date & Time: 02-Dec-2019 (10:00 AM - 11:30 AM)



MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER MASTER IN HOSPITAL ADMINISTRATION DEGREE EXAMINATION - DECEMBER 2019
SUBJECT: MHA 601 - OPERATIONS RESEARCH IN HEALTHCARE
(REGULARS & REPEATERS)
Monday, December 02, 2019 (10.00 - 11.30)

Marks: 50

Duration: 90 mins.

Answer both the questions given below.

1A) What are the primary reasons for holding inventory? (10)

1B) Obtain initial basic feasible solution for the following transportation problem table using both North-West corner and Vogel's Approximation methods with corresponding total cost. (10)

Source	Destination				Supply
	A	B	C	D	
1	3	1	7	4	300
2	2	6	5	9	400
3	8	3	3	2	500
Demand	250	350	400	200	

2) Answer all the following questions:

2A) a) A pharmaceutical firm produces two products namely, Paracetamol and Tetracycline. Each unit of Paracetamol requires 2 hrs of operation I and 3 hrs of operation II, while each unit of Tetracycline requires 3 hrs of operation I and 4 hrs of operation II. Total time available for operation I and II are 14 hrs and 18 hrs respectively. Paracetamol sells at profit of ₹2 per unit, while Tetracycline sells at a profit of ₹4 per unit. Formulate the linear programming problem to determine the quantities of Paracetamol and Tetracycline to be produced, so that the profit earned is always maximum. (5)

b) Draw the line $x=4$.
(4+1 = 5 marks)

2B) A machine tool company decides to make four subassemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each subassembly is determined by the bids submitted by each contractor and is as shown in the table below (in thousands of rupees). Assign different assemblies to contractors so as to minimize the total cost. (5)

Sub-assembly/Contractor	A	B	C	D
1	32	38	40	28
2	40	24	28	21
3	41	27	33	30
4	22	38	41	36

2C) A hospital is exploring the level of staffing needed for a booth in the local mall, where they would test (5)

and provide information on diabetes. Previous experience has shown that, on average, every twenty minutes a new person approaches the booth. A nurse can complete testing and answering the queries in sixteen minutes on the average. If there is a single nurse at the booth, calculate system performance measures including idle time and the probability of one or two persons waiting in the queue. What happens to the utilization rate, if another workstation and nurse are added to the unit?

2D) Write a note on project network. (5)

2E) Consider the following table summarizing the details of a project involving 11 activities:

Activity	Predecessors	a	m	b
A	-	6	7	8
B	-	1	2	9
C	-	1	4	7
D	A	1	2	3
E	A, B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E, F	4	4	4
I	E, F	4	4	10
J	D, H	2	5	14
K	I, G	2	2	8

In this project network problem A - D1 - E - H - J is the critical path (where D1 is a dummy activity). Then answer the following questions.

- i) Find the expected project completion time and variance of project completion time. (2)
- ii) What is the probability of completing the project on or before 25 weeks? (1)
- iii) If the probability of completing the project is 0.84, find the expected project completion time. (2)

2F) Define the following terms which are used in the theory of Project Networks: Network Crashing, Direct cost, Indirect cost, Normal cost and Normal time. (5)
(1 mark × 5 = 5 marks)

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