

Question Paper

Exam Date & Time: 28-Dec-2020 (02:30 PM - 04:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER MASTER OF HOSPITAL ADMINISTRATION DEGREE EXAMINATIONS-DECEMBER 2020 / JANUARY 2021

SUBJECT: MHA 601: OPERATIONS RESEARCH IN HEALTHCARE
(REGULARS)

Marks: 50

Duration: 120 mins.

Answer all the questions.

- 1) Compare and contrast the Fixed order quantity system with Fixed period system. (10)

2. Answer the following questions.

- 2A) A pharmaceutical firm produces two products namely, Paracetamol and Tetracycline. Each unit of Paracetamol requires 3 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 16 hrs and 18 hrs respectively. Paracetamol sells at profit of ₹3 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. (4)

- 2B) In a Linear Programming Problem (LPP), when do you use the graphical method to solve LPP? (1)

- 2C) Find the region bounded by the following inequalities: (5)

$$\begin{aligned}3x + y &\leq 66, \\x + y &\leq 45, \\x &\leq 20, \\y &\leq 40, \\x, y &\geq 0.\end{aligned}$$

- 3) Obtain initial basic feasible solution for the following transportation problem table using Least-Cost method and also the corresponding total cost. (5)

Source	Destination				Supply
	A	B	C	D	
1	21	16	25	13	11
2	17	18	14	23	13
3	15	20	12	15	19
Demand	6	10	12	15	

- 4) Five jobs are to be done on five different machines in a lab. The cost of producing j^{th} job on the i^{th} machine is given below. Assign the jobs to different machines, so as to minimize the total cost. (5)

Jobs/Machines	A	B	C	D	E
1	9	3	1	13	1
2	1	17	13	20	5
3	0	14	8	11	4
4	19	3	0	5	5
5	12	8	1	6	2

(1 mark x 5 = 5 marks)

- 5) VVH hospital had been receiving complaints from patients related to crowded conditions in the waiting area for magnetic resonance imaging (MRI) procedures. VVH wanted on an average of only one patient waiting in line for the MRI. The organization collected data on arrival and service rates and found that for MRI the mean service rate (μ) was four patients per hour, exponentially distributed. VVH also found that arrivals followed a Poisson distribution and that mean arrival rate was three patients per hour (λ). (5)
- a) What is the utilization rate of MRI?
 - b) What is the idle rate of MRI?
 - c) Find the average waiting time in a line.
 - d) Find the average time in the system.
 - e) Find the average number of patients in the system.
- (1 mark x 5 = 5 marks)

- 6) Consider the following table containing 14 activities: (5)

Activity	predecessors	Duration (months)
A	-	2
B	-	6
C	-	4
D	B	3
E	A	6
F	A	8
G	B	3
H	C, D	7
I	C, D	2
J	E	5
K	F, G, H	4
L	F, G, H	3
M	I	13
N	J, K	7

Construct CPM network for the above table.

- 7) Describe the three time estimates of PERT and also the formula of the expected project completion time, variance of the project completion time. (5)
- 8) Explain the four ways of Crashing the time taken by an activity in the project management and also write the assumption of critical path analysis. (5)

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