



**International Institute of Health Management Research (IIHMR), New Delhi.**  
**POSTGRADUATE DIPLOMA HOSPITAL AND HEALTH MANAGEMENT**  
**(Health Management Stream)**  
**(Batch 2019-2021)**  
**OPERATIONS RESEARCH IN HEALTHCARE**  
**(HEM-713)**

**End Term Examination**

**Time allowed: 2 hrs**

**Max. Marks: 70**

**(Answer any five questions)**

**Each question carries 14 marks**

**(5 x 14 = 70 marks)**

1. What is operations research? How can OR people help? How can OR be applied in the field of healthcare?
2. At a pharmacy, the arrival rate is two per hour and the service potential is three per hour. The hourly wage paid to the pharmacist at the pharmacy is Rs 15 per hour and the hourly cost of a customer away from his/her work is Rs 40 per hour.
  - (a) Calculate the average number of customers being served or waiting to be served at any given time.
  - (b) Calculate the average time a customer spends waiting for service.
  - (c) Calculate the total cost (cost of pharmacist and cost of waiting) of operating the pharmacy for 8 hour day.
  - (d) Calculate the cost of system if there were two pharmacist working together as a team, each paid Rs 15 per hour and each able to service on average two customers per hour.
3. A small project consisting of eight activities has the characteristics:-

Activity	Preceding activity	Most optimistic time (a)	Most likely time (m)	Most Pessimistic time (b)
A	None	2	4	12
B	None	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B,C	9	9	9
G	D	3	3.5	7
H	E,F,G	5	5	5

- (a) Draw PERT network for the project
- (b) Prepare activity schedule for the project
- (c) Determine the critical path
- (d) If a 30 week deadline is imposed, what is the probability that the project will be finished within the time limit.  
If the project manager wants to be 99% sure that the project is completed on

the schedule date, how many weeks before that date should he start the project work?

4. Assume you have a product with the following parameters:

Demand = 360

Holding cost per year = \$1.00 per unit

Order cost = \$100 per order

- What is the EOQ?
  - Assuming a 300-day work year; how many orders should be processed per year? What is the expected time between orders?
  - Assume that the demand was actually higher than estimated (i.e., 500 units instead of 360 units). What will be the actual annual total cost?
5. A car company is doing a research survey at its various showrooms in Delhi for a new car. The company determines that it must fulfill several requirements in order to draw statistically valid conclusion for the demand of a car with additional new features.
- Survey at least 2300 outlets in total
  - Survey at least 1000 outlets in South Delhi where it's showrooms are available
  - Survey at least 600 outlets in East Delhi where it's showrooms are not available
  - Ensure that atleast 15% of those surveyed are located in South Delhi
  - Ensure that no more than 20% of those surveyed have no showrooms available in East Delhi

The per unit cost of conducting survey:-

Region	With Showroom	With no Showroom
South Delhi	7.50	6.80
East Delhi	10.90	9.20

The company wants to minimize the survey cost.

6. Solve the assignment problem:-

	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	5	2	2
E	1	5	6	5	4

7. A healthcare company has five machines that has 4 jobs. Each job can be given to one and only machine. The cost of each job on each machine is given in following table.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>1</b>	5	7	11	6	7
<b>2</b>	8	5	5	6	5
<b>3</b>	6	7	10	7	3
<b>4</b>	10	4	8	2	4

What should be the total cost incurred in completing these four jobs?