



School of Development Studies

MBA Rural Management

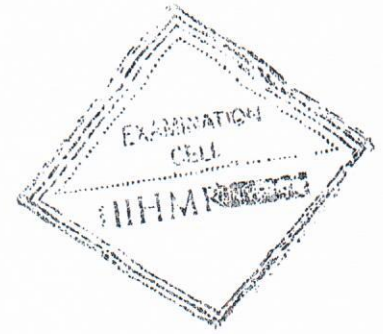
Batch-7 (2018-2020)

2nd Year

Production and Operation Management

Term Examination

August 2019



Time - 3 Hour

MM-70

The question paper contains 4 printed pages.

The question paper contains 9 Questions. Candidates are required to answer any *five (5)* questions.

Q. 1. What is Production and Operations Management ("POM")? Explain the techniques of POM which could be applied for improving organization's efficiency and effectiveness in delivering products and services in a rural development organization. (14)

Q. 2. Table below shows the precedence relationships among the activities to complete a rural project.

Activity	Predecessor	Duration (days)
A	-	18
B	A	19
C	A	17
D	B	15
E	C	18
F	D	13
G	E	17
H	F,G	12

- (i). Construct an activity on arrow network for the project. (4)
(ii). Determine the critical path and the expected project completion time. (4)
(iii). Find the ES, LS, EF, LF, and slack time for each activity. (6)

Q. 3. An operations manager of a rural project has estimated that there is considerable uncertainty about how long each group will need to do its work. Using the PERT three-estimate approach, each group has provided a most likely estimate, an optimistic estimate, and a pessimistic estimate of the duration of that group's activity. This has been mentioned in the table below.

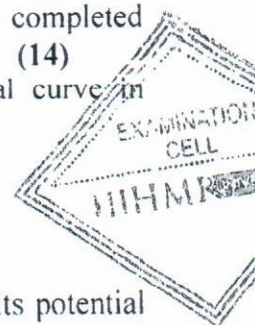
Activity Name	Predecessor	Optimistic time	Most likely time	Pessimistic time
A	-	1.2 months	1.5 months	15 months
B	-	1.2 months	3.5 months	21 months

C	A	1.1 month	1.5 months	18 months
D	B	0.5 month	1.1 months	15 months
E	A	1.3 months	1.5 months	24 months
F	C	1.1 month	1.2 months	16 months
G	D	0.5 month	1.1 months	14 months
H	B	2.5 months	3.5 months	25 months
I	E,F	1.1 month	1.3 months	18 months
J	G,H	1.2 months	1.3 months	18 months

To beat the competition, the operations manager wants the project to be completed in 22 months if possible. Find the approximate probability that the project will be completed within 22 months. (14)

You can use the following extract of table showing area under the normal curve in answering the question:

Z	0.87	1.10	1.12	1.14	1.7	1.9	2.0
Area	.3078	.3643	.3686	.3729	.4554	.4713	.4772



- Q. 4.** An insurance company desires to enter the rural health care market and offer its potential customers both a staff model health maintenance organization (HMO) and commercial indemnity insurance. The company is deciding how to allocate its marketing efforts between those options to maximize its profits. The analysts have estimated that the company will realize a profit of \$ 1,200 per enrollee from the HMO, and \$ 600 per enrollee from commercial plans. Furthermore, for the coming year the company is forced to rely on its present resources in terms of sales force. The administrative support of the HMO will take two hundred hours, and the commercial administration will take, on average, four hundred hours; currently, the company can allocate 1.6 million hours to sales. To break even, the HMO requires that the contribution margins (contribution margin is sales revenue less variable costs) for enrollees must exceed \$ 1.5 million. The estimated contribution margins are \$ 500 and \$ 300, for HMO and for commercial insurance enrollees, respectively. With a limited number of physicians participating in the staff model HMO at the present time, the HMO can handle at most 5,000 enrollees. Formulate the problem and identify the decision variables and find out how the resources should be allocated to each program so as to maximize the profits. (14)

- Q. 5.** An NGO has five persons working in MCH department – Satish, Lalita, Bindu, Chitra and Raj. Each of these individuals is uniquely qualified with experience in specific components. The Coordinator of this department has just received five jobs that be assigned to these individuals, and only one job may be assigned to each individual. The estimated number of days required to complete each of these jobs by the five individuals is given in the table below.

		Jobs				
		I	II	III	IV	V
Employees (Persons)	Satish	10	5	13	15	16
	Lalita	3	9	18	13	6
	Bindu	10	7	2	2	2
	Chitra	7	11	9	7	12
	Raj	7	9	10	4	12

The Coordinator would like to minimize the number of days required for the completion of these jobs. Solve this using Hungarian method. How many work days will be required to complete these jobs? Who will be assigned to each job? (14)

- Q. 6.** (a) Explain the factor rating method in selecting a location of a plant or facility. (4)
- (b) A manufacturer of a farm equipment has to decide on the location of the plant. Three locations are being considered viz. Mysore, Bangalore and Hosur. The fixed costs at the three locations are estimated to be Rs. 30 lakh, 50 lakh and 25 lakh per annum respectively. The variable costs are Rs. 300, Rs. 200 and Rs. 350 per unit, respectively. The expected sales price of the equipment is Rs. 700 per unit.
- (i). Find out the range of annual production/sales volume for which each location is the most suitable. Explain by drawing a neat graph. (6)
- (ii). Which one of the three is the best location at the production/sales volume of 18000 units. (4)
- Q. 7.** The following data corresponds to the annual consumption of items for an agribusiness company which was obtained from store inventory records:

Item No.	Annual Consumption (No. of items)	Price per item (Rs.)
1	3000	200
2	60,000	2
3	20	5000
4	200	12.5
5	350	9
6	6000	25
7	40	1000
8	300	70

For inventory control reasons the organization wants to classify the items into three categories A, B, and C according to the following basis.

Category	Percentage of total ACV
A	70
B	20
C	10

Draw an ABC analysis graph after classifying A, B & C class items.

(14)

- Q. 8.** (a) Explain in brief the 7 QC tools which can be applied in identifying quality problems and causes. (4)
- (b) A food processing company had a goal to provide his customers with a certain minimum amount of food product in the packet. For assuring this, Joe Wilson, the operations manager wants to construct $\bar{x}$ and R charts at the filling operation for the 16-ounce product. Joe Wilson collected the data from the filling operation for 12 hourly samples of 20 boxes each as shown below:

Sample Number	Sample Mean (Ounces)	Sample Range (Ounces)
1	16.2	2.0
2	15.9	2.1
3	16.3	1.8
4	16.4	3.0
5	15.8	3.5
6	15.9	3.1

7	16.0	2.9
8	16.1	1.8
9	16.3	1.5
10	16.3	1.0
11	16.4	1.0
12	16.5	0.9

Compute the upper and lower control limits for the $\bar{x}$ and R charts and draw these charts.
 (Factor for $\bar{x}$ chart $A_2 = 0.180$; Factor for R chart $D_3 = 0.414$ and $D_4 = 1.586$) (10)

Q. 9. Write short notes on any two of the following :

(7 x 2)

- Demand Forecasting techniques in OM.
- Inventory Management - EOQ Analysis.
- Transportation Problem
- Facility layout.
- Queuing and capacity planning.
- FMEA for risk analysis in drinking water systems

