

GANPAT UNIVERSITY

B. Tech. Semester: VII (Mechatronics) Engineering

CBCS Regular Examination December - 2013

2MC704 - Operation Management

Time: 3 Hours

Total Marks: 70

Instruction:

1. Use separate answer book for each section.
2. Figures to the right indicate full marks of questions.
3. Assume suitable data if required.
4. Use graph- paper for graphical method only.

Section - I

Que.1

12

[A] Define the following term:

- | | |
|--------------------|--------------------|
| 1. AQL | 2. AOQL |
| 3. Producer's Risk | 4. Consumer's Risk |

[B] Explain the purpose of product design. State the requirements of good design.

[C] Explain the term 'Economic order quantity' in detail. Derive the formula for EOQ.

OR

Que.1

12

[A] What general factors govern the choice between single sampling plan and multiple sampling plans? Explain.

[B] Explain the term "Loading" and "Scheduling" of PPC.

[C] Describe the A-B-C approach to inventory control.

Que.2

11

[A] A quality control inspector at Crunchy Potato Chip Company has taken 10 samples with 4 observations each of the weight of bags filled. Use the following information to develop mean and range control charts. State whether the process is in control or not. ($A_2=0.73$, $D_3=0$, $D_4=2.28$)

Samples of potato chip bag weight in Ounces				
Sample No.	Observations			
	1	2	3	4
1	12.5	12.3	12.6	12.7
2	12.8	12.4	12.4	12.8
3	12.1	12.6	12.5	12.4
4	12.2	12.6	12.5	12.3
5	12.4	12.5	12.5	12.5
6	12.3	12.4	12.6	12.6
7	12.6	12.7	12.5	12.8
8	12.4	12.3	12.6	12.5
9	12.6	12.5	12.3	12.6
10	12.1	12.7	12.5	12.8

[B] Zen Bicycles Ltd sources 3000 seat covers for its bicycles from an outside supplier. The ordering cost is Rs. 10 per order and the carrying cost is Rs. 6 per unit per year. The company has 300 working days per year.

Find the (a) EOQ (b) no. of orders per year (c) total inventory cost (d) no. of inventory cycles in a year (e) duration of an inventory cycle

OR

Que.2

11

[A] Ganpat Global Inc sells magazines. Monthly sales for a eight month period were as follows:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Sales in 10000 units	20	15	18	22	26	21	24	28

Forecast September sales volume using each of the following:

- A four month moving average
- Exponential smoothing with a smoothing constant equal to 0.20, assuming a January forecast of 190000.

[B] A factory requires 18000 units per year, each costing Rs.27. The cost per order is Rs.150 and the inventory carrying charges working out to 20 percent of the average inventory. Find the economic order quantity and number of orders per year.

Would you accept a 2 percent discount on a minimum supply quantity of 1200 units? Compare the total cost in both the cases.

Que.3

12

Answer the following: (Any Three)

- Comment on "PPC contributes to effective utilization of firm resources"
- List the specific weaknesses of each of these approaches to developing a forecast:
 - Consumer Surveys
 - Sales force Opinions
 - Executive Opinions
- The following table gives the no. of errors in alignment observed at the final inspection of a certain model of a car.

Car no.	1	2	3	4	5	6	7	8	9	10
No. of alignment defects	7	6	6	7	4	7	8	12	9	9
Car no.	11	12	13	14	15	16	17	18	19	20
No. of alignment defects	9	8	15	6	4	13	7	8	15	6

Calculate control limits and draw suitable charts. Also comment on the result.

[D] The annual sales of a company are as given below:

Year	2007	2008	2009	2010	2011	2012	2013
Sales in Rs. (in 1000)	500	625	650	785	705	795	810

Using trend line equation, find the values of each of seven years. Also estimates the annual sales for year 2014.

Section – II

Que.4

12

- [A] 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 units between factories to warehouses are given in the table below:

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

Find the initial basic feasible solution using each of following methods and compare their total costs.

- a) LCM b) NWCM c) VAM

- [B] A company operates in four territories and four salesmen available for an assignment. The territories are not equally rich in their sales potential. It is estimated that a typical salesman operating in each territory would bring in the following annual sales:

Territory	:	1	2	3	4
Annual Sales(Rs.)	:	1,26,000	1,05,000	84,000	63,000

The four salesmen also in their ability. It is estimated that, working under the same conditions. Their yearly sales would be proportionately as follows:

Salesmen	:	A	B	C	D
Proportion	:	7	5	5	4

If the criterion is maximum expected totals sales the intuitive answer is to assign the best salesman to reach richest territory the next best salesman it the second richest and so on; Verify this answer by the assignment technique.

OR

Que.4

12

- [A] Consider the transportation problem shown in below table.

	D1	D2	D3	D4	D5	Capacity
S1	10	2	16	14	10	300
S2	6	18	12	13	16	500
S3	8	4	14	12	10	825
S4	14	22	20	8	18	375
Demand	350	400	250	150	400	

Find the initial basic feasible solution using each of following methods and compare their total costs.

- a) LCM b) VAM

[B] In the modification of a plant layout of a factory four new machines M_1, M_2, M_3 and M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available because of limited speed machine M_2 cannot be placed C and M_3 cannot be placed at A. The cost of locating a machine at a place (in hundred rupees) is as follows.

Machines		A	B	C	D	E
	M_1		9	11	15	10
M_2		12	9	-	10	9
M_3		-	11	14	11	7
M_4		14	8	12	7	8

Find the optimal assignment schedule.

Que.5

[A] A company is planning to determine its product mix out of three different products; P1, P2, P3. The monthly sales of product P1 is limited to maximum of 500 units. For every two units of P2 produced, there will be one unit of by-product which can be sold at the rate of Rs. 20 per unit. The highest monthly demand for this by product is 200 units. The contributions per unit of products P1, P2, P3 are Rs. 50, Rs. 70, Rs. 60, respectively. The processing requirements of these products are shown in table.

Process	Hours per units			Available hours
	P1	P2	P3	
1	3	5	2	1000
2	4	4	3	700
3	4	3	2	1300

[B] Consider the below table summarizing the details of project involving 11 activities.

Activity	Predecessors	Durations(Weeks)		
		Optimistic time	Most likely time	Pessimistic time
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

Find the followings

1. Construct the project network.
2. Find the expected duration and variance of each activity.
3. Find the critical path.

OR

Que.5

- [A] Explain difference between PERT & CPM. 3
- [B] An established decided to add a new product to its line. It will buy the product from mfg. concern, package it, and sell it to no. of distributors that have been selected on geographical basis. The step shown in the following table is to be planned. 8

Activity	Description	Predecessors	Duration(days)
A	Organize sales office	-	6
B	Hire salesmen	A	4
C	Train the salesmen	B	7
D	Select advertising company	A	2
E	Plan campaign	D	4
F	Conduct campaign	E	10
G	Design packages	-	2
H	Setup packaging facilities	G	10
I	Packaging initial stocks	J,H	6
J	Order stock	-	13
K	Select distributors	A	9
L	Sell to distributors	C,K	3
M	Ship stocks to distributors	I,L	5

Determine the followings:

1. Critical path of network diagram.
2. Free and total float of diagram

Que.6

Answer the followings: (Any Two)

12

- [A] Use the simplex method to solve the following LP problem.

$$\text{Maximize } Z = 3X_1 + 5X_2 + 4X_3$$

Subject to constraints

$$(i) 2X_1 + 3X_2 \leq 8, \quad (ii) 2X_2 + 5X_3 \leq 10, \quad (iii) 3X_1 + 2X_2 + 4X_3 \leq 15 \quad (iv) X_1, X_2, X_3 \geq 0$$

- [B] Solve the following LP problem using graphical method.

$$\text{Maximize } Z = 10X_1 + 20X_2$$

Subject to

$$i. 2X_1 + X_2 \leq 40 \quad ii. 5X_1 - 2X_2 \leq 20 \quad iii. X_1 \geq 25 \quad iv. X_1, X_2 \geq 0$$

- [C] In a railway marshaling yard, goods train arrives at the rate of 30 trains per day. Assuming that inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes.

- 1) Calculate expected queue size.
- 2) Probability that the queue size exceed 10.
- 3) If the input of trains increased to an average 33 per day, what will be change in 1 & 2.

END OF PAPER