

## GANPAT UNIVERSITY

B. Tech. Semester VIII (Mechanical Engineering)

CBCS Regular Examination April – June 2016

2ME802 Production &amp; Operations Management

Time: 3 Hours

Total Marks: 70

- Instruction:**
1. Answer all the questions.
  2. Assume suitable data if necessary.
  3. Figures to the right indicate the full marks of questions.

## Section – I

Que. 1

Answer the following questions.

[12]

- (A) A company has three production facilities  $S_1$ ,  $S_2$ , &  $S_3$  with production capacity of 7, 9, & 18 units (in 100s) per week of a product respectively. These units are to be shipped to four ware houses  $D_1$ ,  $D_2$ ,  $D_3$ , &  $D_4$  with requirements of 5, 6, 7, & 14 units (in 100s) per week respectively. The transportation costs (in Rs.) per unit between factories to ware houses are given below table:

[4]

Data	$D_1$	$D_2$	$D_3$	$D_4$	Supply
$S_1$	19	30	50	10	7
$S_2$	70	30	40	60	9
$S_3$	40	8	70	20	18
Demand	5	8	7	14	34

Formulate this transportation model by North-West Corner Method (NWCM).

- (B) An Established company decided to add a new product to its line. It will buy the product from manufacturing concern, package it, sell it to number of distributors that have been selected on geographical basis. Market research has already indicated the volume expected and the size of sales force required. The steps shown in the following table are to be planned.

[8]

Activity	Descriptions	Predecessors	Duration (Days)
A	Organize sales office	-	6
B	Hire salesmen	A	4
C	Train	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

- (a) Draw an arrow diagram for this project
- (b) Indicate the critical path
- (c) For each non-critical activity, find the total and free float.

OR

Que. 1

Answer the following questions.

[12]

- (A) A super market has a single cashier. During the pick hours, customers arrive at a

[6]



rate of 20 customers per hour. The average number of customer that process by cashier is 24 per hour. Calculate:

- Probability that the cashier is idle.
- The average number of customer in queue system.
- The average time a customer spent in the system
- The average number of customer in queue.
- The average time the customers spent in the queue for service.

- (B) The following data shows the values of sample mean and the range R for 10 samples of size 5 each. Calculate the values for center line and control limits for mean chart and range chart and determine whether the process is under control. [6]

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	11.2	11.8	10.8	11.6	11	9.6	10.4	9.6	10.6	10
R	7	4	8	5	7	4	8	4	7	9

Que. 2

Answer the following questions.

- (A) One of the product groups of a manufacturer of office furniture is desks. The number desks sold during the past 10 years is as follows: [11]  
[8]

Year	Number of Desks	Year	Number of Desks
1	11922	6	10168
2	10417	7	12574
3	13060	8	9856
4	11841	9	11333
5	14183	10	10716

For production planning purposes, annual sales are estimated for this product group and then broken down by type of desk. What would these group forecasts have been for year 5 through 11 with each of the following techniques?

- An un-weighted four-year moving average approach.
  - A weighted four-year moving average approach in which a weight of 0.1 was assigned to first year; 0.2 to the second year, 0.3 to the third year and 0.4 to the fourth.
  - An exponential smoothing approach in which a smoothing factor of 0.05 was used and in which the weighted four year moving average was used as the forecast for year 5.
- (B) Explain the concept of quality circle. [3]

OR

Que. 2

Answer the following questions.

A spoliators firm employs typists on hourly piece-rate basis for their daily work. There are five typists and their charges and speed are different according to an earlier understanding only one job is given to one typist is paid for a fraction of an hour. Find the least cost allocation for the following data. [11]  
[8]

Typist	Rate/hour (Rs)	No. of pages (type/hr)
A	5	12
B	6	14
C	3	8
D	4	10
E	4	11



Job	P	Q	R	S	T
No. of pages	199	175	145	298	178

- (B) What is an operating characteristics curve? How it is useful in acceptance sampling? [3]

Que. 3

Answer the following questions. (Attempt any three)

[12]

- (A) What do you mean by inspection? Explain its objectives.  
 (B) What is role of statistics in quality control? Give example of situation where is applicable & where it's not applicable.  
 (C) A nursing home has one year moving average forecasting method to produce a particular medicine requirement. The actual demand for the item is shown in the table below:

Month	1	2	3	4	5	6	7	8	9	10	11	12
Demand	90	80	65	70	100	85	60	75	90	85	60	75

Using the 12 month moving average, find the exponential smoothing forecast for 13th the month.

- (D) Define the following terms.

(1) Events (2) Total Float (3) Pessimistic time (4) Most likely time

## Section – II

Que. 4

Answer the following questions.

[12]

- (A) Discuss the importance of Operation Research in the decision making process. Give the application of operation research in industry. [6]  
 (B) (1) A manufacturing company is engaged in producing three types of products: A, B, and C. The production department daily produces components sufficient to make 50 units of A, 25 units of B and 30 units of C. The management is confronted with the problem of optimizing the daily production of products in assembly department where only 100 man hours are available daily to assemble the products. The following additional information is available. [6]

Type of product	Profit contribution per unit of product (Rs)	Assemble time per product (hrs)
A	12	0.8
B	20	1.7
C	45	2.5

The company has a daily order commitment for 20 units of product A and total units of B and C product. Formulate this problem as an LP model so as to minimize the total profit.

- (2) Use graphical method to solve given LP Problem,

$$Z_{(\text{Max.})} = 15X_1 + 10X_2$$

Sub to constraints,

$$4X_1 + 6X_2 \leq 360$$

$$3X_1 \leq 180$$

$$5X_2 \leq 200$$

$$X_1 \text{ \& } X_2 \geq 0$$



OR

Que. 4

Answer the following questions.

- (A) What are the steps involved in Operation Research Problems? Explain in brief. [6]  
(B) Use the simplex method to solve given LP Problem, [6]  
Maximize  $Z = 3X_1 + 5X_2 + 4X_3$

Subject to constraints,

$$2X_1 + 3X_2 \leq 8$$

$$2X_2 + 5X_3 \leq 10$$

$$3X_1 + 2X_2 + 4X_3 \leq 15.$$

$$X_1, X_2 \text{ \& } X_3 \geq 0.$$

Que. 5

Answer the following questions.

[11]

- (A) Define linear programming? Write down the application of linear programming.  
(B) The purchase manager currently follows EOQ policy of ordering for an item in the stores of his company. The annual demand of the item is 1600 units. Its carrying cost is 40% of the unit cost where the unit cost is Rs. 400. The ordering cost is Rs. 500 per order. Recently, the vendor supplying that item gives a discount of 10% in its unit cost if the order size is minimum of 500 units.  
(a) Find EOQ and the corresponding total cost per year.  
(b) Check whether the discount offer given by the vendor can be considered by the purchase manager.

OR

Que. 5

Answer the following questions.

[11]

- (A) Explain ABC analysis used in inventory control.  
(B) The annual demand for a component is 7200 units. The carrying cost is Rs. 500/unit/year, the ordering cost is Rs. 1500 per order and the shortage cost is Rs. 2000/unit/year. Find the optimal values of economic order quantity, maximum inventory, maximum shortage quantity, cycle time (t), inventory period (t<sub>1</sub>) and shortage period (t<sub>2</sub>).

Que. 6

Answer the following questions. (Attempt any three)

[12]

- (A) What is value engineering? Give the merits and application of the value engineering.  
(B) What is the purpose of acceptance samplings? How acceptance sampling does before process control?  
(C) Discuss "Loading" and "Scheduling" is an essential part of "Production Control."  
(D) Explain the batch production system. State the characteristics of batch production system.

END OF PAPER