

more economically meet the demand for chocolate candies.

Quarter	Sale Forecast (grams)
Spring	80,000
Summer	50,000
Fall	1,20,000
Winter	1,50,000

The wage rate is Rs. 100 per worker for hiring. Cost of decreasing the workforce is Rs. 500 per worker. Holding cost per quarter is Rs. 0.50 per gram. Regular production is carried out at the cost of Rs. 2 per gram. Each employee can produce 1000 grams of chocolate candies in a quarter. 100 workers are employed at the beginning of the planning period. (8)

### Control Chart Factors

Sample Size $n$	Mean Factor $A_2$	Upper Range $D_4$	Lower Range $D_3$
2	1.880	3.268	0
3	1.023	2.574	0
4	.729	2.282	0
5	.577	2.115	0
6	.483	2.004	0
7	.419	1.924	0.076
8	.373	1.864	0.136
9	.337	1.816	0.184
10	.308	1.777	0.223
12	.266	1.716	0.284

(500)

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Monday

[This question paper contains 10 printed pages.]

(Evening)

Your Roll No.....

Sr. No. of Question Paper : 9558

Unique Paper Code : 61015913

Name of the Paper : Production and Operations Management (GE)

Name of the Course : Bachelor of Management Studies (BMS), 2018 (CBCS)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

### Instructions for Candidates

- Write your Roll No. on the top immediately on receipt of this question paper.
- Answer any **five** questions.
- All** questions carry equal marks.
- Attempt all parts of a question together.
- Show your workings clearly on the answer sheet itself.
- Use of simple calculator is allowed.

- What is operations strategy? Explain the relationship between operations strategy and overall business strategy of an organisation. (6)
  - What are the main advantages that quantitative techniques for forecasting have over qualitative techniques? (5)

P.T.O.

- (iii) Assume that your stock of sales merchandise is maintained based on the forecast demand. If the distributor's sales personnel call on the first day of each month, compute your sales by each of the three methods mentioned below.

Month	Actual Demand
June	140
July	180
August	170

- (a) Using a simple three-month moving average, what is the forecast for September?
- (b) Using a weighted moving average, what is the forecast for September with weights of 0.20, 0.30 and 0.50 for June, July and August respectively?
- (c) Using exponential smoothing and assuming that the forecast for June has been 130, forecast the demand for September with a smoothing constant alpha of 0.30. (4)
2. (i) Define the term waste. Identify different sources of waste in a hospital and list down ways to eliminate it. (4)

- (a) FCFS  
 (b) SPT  
 (c) EDD  
 (d) CR

Job	Processing Time (days)	Due Date (days from present time)
A	2	7
B	8	16
C	4	4
D	10	17
E	5	15
F	12	18

If a fine of Rs. 500 is charged for each day of lateness, which priority rule would you recommend? (7)

- (ii) Chocolate Factory Pvt. Ltd. makes a variety of candies in three factories worldwide. Its line of chocolate candies exhibits a highly seasonal demand pattern, with peaks during winter months (for the holiday season and Valentine's Day) and drops during the summer months (when chocolate tends to melt and customers are watching their weight). Given the following costs and quarterly sales forecasts determine whether (a) level production, or (b) chase demand, would

- (a) Draw a precedence diagram for the above tasks.
- (b) What is the workstation cycle time required to manufacture 120 TV sets in a 40-hour work week?
- (c) What is the theoretical minimum number of workstations?
- (d) Assign tasks to workstations using the criterion of longest operating time.
- (e) What is the efficiency of your line balance, assuming it is running at the cycle time from part (b)?
- (f) If demand for TV sets is reduced to 100 sets per 40-hour week, how would it affect the cycle time and minimum number of workstations? (10)
6. (i) The processing times (including setup times) and due dates for six jobs waiting to be processed at a work centre are given in the following table. Determine the sequence of jobs, the average flow time, average lateness, and the average number of jobs at the work centre, for each of the following rules :

- (ii) What do you mean by maintenance management? Describe various performance measures of maintenance management. (4)

- (iii) The investment staff of a consulting firm is considering 4 investment proposals for a client; shares, bonds, real estate and saving certificate. These investments will be held for one year. The past data regarding the 4 proposals are given below :

Shares: there is a 25% chance that the shares will decline by 10%, a 30% chance that they will remain stable and a 45% chance they will increase in value by 15%. Also the shares under consideration do not pay any dividends.

Bonds: these bonds stand a 40% chance of increase in value by 5% and 60% chance of remaining stable and they yield 12%.

Real Estate: this proposal has a 20% chance of increasing 30% in value, a 25% chance of increasing 20% in value, a 40% chance of increasing 10% in value, a 10% chance of remaining stable and a 5% chance of losing 5% of its value.

Saving Certificate: these certificates yield  $8\frac{1}{2}\%$  with certainty.

Use a decision tree to structure the alternatives available to the investment staff. (7)

3. (i) All the six jobs listed below must be polished first then machined. Assuming that the work can start only when all the six jobs arrive in the order given, determine the optimal sequence of the jobs. Develop a schedule table and Gantt-chart. Also evaluate the performance measures for the schedule giving minimum elapsed time and total idle time of machining and polishing. (7)

Job	Machining (hours)	Polishing (hours)
A	8	9
B	1	2
C	3	5
D	8	6
E	7	5
F	7	4

- (ii) A Departmental store maintains a successful catalogue sales department in which a clerk takes orders by telephone. If the clerk is occupied on one line, incoming phone calls to the catalogue department are answered automatically by a recording machine and asked to wait. As soon as the clerk is free, the party that has

Develop a mean-chart in conjunction with a range-chart to monitor the response times and indicate if the process appears to be in control. If the EMR team cannot consistently meet its target, what kind of actions might it need to achieve its target? (10)

5. (i) Explain batch and continuous processes. How would process planning differ for the two? (5)
- (ii) Best Vision is revamping its assembly lines to improve efficiency. As shown below, there are 10 steps to assembling a television set.

Task	Precedence	Time (minutes)
A	-	8
B	A	4
C	A	7
D	A	3
E	B	7
F	C, E	11
G	D	2
H	G	8
I	F, H	5
J	I	7

- (ii) The Emergency Medical Response (EMR) team in a city has instituted a quality improvement program and it makes extensive use of SPC charts. It wants to monitor the response times for emergency calls to make sure they stay around nine minutes on average. The EMR administration staff has randomly timed five emergency calls each month during a 12 month period and collected the following data :

Month	Response Times (minutes)				
1	8.6	4.5	6.2	5.7	10.1
2	10.1	8.9	7.3	8.1	6.4
3	5.3	9.4	10.2	10.2	5.8
4	6.1	11.5	9.3	9.4	9.6
5	12.4	8.3	12.4	10.1	8.4
6	9.7	10.4	7.5	8.5	11.6
7	6.5	5.9	5.6	7.7	9.1
8	15.6	6.6	10.7	11.5	7.5
9	12.5	3.6	8.5	6.4	9.6
10	9.3	7.4	9.9	10.4	14.3
11	14.5	8.6	9.3	5.3	10.6
12	10.3	9.6	11.2	7.5	6.9

waited the longest is transferred and answered first. Calls come in at a rate of 12 per hour. The clerk is capable of taking an order in an average of 4 minutes. It is assumed that arrival of calls follows a Poisson distribution and service times follow an exponential distribution. The clerk is paid Rs. 100 per hour. A customer satisfaction survey estimates that the departmental store suffers approximately Rs. 50 in lost customers and goodwill for every hour that the customer spends waiting for the clerk to take an order.

- (a) Find the average number of callers waiting in line to place the orders.
- (b) What percentage of time is the clerk busy?
- (c) What is the average time that catalogue customers must wait before their calls are transferred to the order clerk?
- (d) Determine the total expected cost per hour in terms of clerk payment and customer dissatisfaction. (8)

4. (i) Identify three important factors that a location planner may consider with respect to each of the following :
  - (a) A super-speciality intensive care unit
  - (b) A thermal power plant operating with coal as its fuel (5)