

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2024

MECHANICAL ENGINEERING

(2020 SCHEME)

Course Code : 20MET461

Course Name: Operations Management

Max. Marks : 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

1. What is the system concept of production and how does it impact modern manufacturing processes?
2. What are the criteria for make or buy decisions?
3. How would you analyse the factors that influence capacity planning in a manufacturing facility?
4. How does a cellular layout integrate both product and process characteristics in manufacturing processes?
5. Explain the key components involved in the process of forecasting?
6. How do trends, cycles, and seasonal patterns differ from one another in the context of time series analysis?
7. Differentiate between pure strategy and mixed strategy in aggregate planning.
8. What are the fundamental requirements for Material Requirements Planning (MRP)?
9. Describe the single machine scheduling problem concept.
10. What are Gantt charts, and why are they frequently utilized in project management?

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) How would you analyze and evaluate the key components of a specific process in order to identify opportunities for improvement and innovation through process reengineering? (7)
b) How do operational activities intersect and collaborate with various functional areas within an organization? (7)

OR

12. A development company is attempting to determine the location for a new outlet mall. The region where the outlet mall will be constructed includes four towns, which together have a sizable population base. The grid map coordinates of the four towns and the population of each are as follows: (14)

Town	Coordinates		Population (10000s)
	x	y	
1	40	60	6.7
2	40	40	4.3
3	20	70	5.8
4	40	50	3.4

Determine the best location for the outlet mall using the centre-of-gravity method. On a grid map, illustrate the positions of four towns and indicate the location of the new mall.

MODULE II

- 13. a) Compare and contrast the various types of layouts in facility planning and their respective advantages and disadvantages. Evaluate which layout would be most suitable for a specific manufacturing process? (8)
- b) Explain the steps involved in CORELAP and ALDEP methodologies when applied to layout planning? (6)

OR

- 14. Consider the following assembly network relationships of a product. The number of shifts per day is two and the number of working hours per shift is 8. The company aims to produce 80 units of product per day. Group the activities into workstations using rank positional weight method and compute balancing efficiency (14)

Operations No:	1	2	3	4	5	6	7	8	9	10
Immediate preceding task	-	1	1	1	2,3	3,4	5	5,6	4,6	7,8,9
Duration (min)	7	2	2	5	8	3	4	7	9	8

MODULE III

- 15. A retail store is planning its inventory management for the upcoming holiday season. They have historical sales data for the past five years and want to use a weighted moving average to forecast demand for their top-selling product. The weights assigned to each year are as follows: (14)

Year	1	2	3	4	5
Weights	0.1	0.15	0.2	0.25	0.3

Calculate the forecast for the upcoming holiday season based on this weighted moving average method. What are the advantages and disadvantages of using this approach, and how can the store fine-tune their weights to improve the accuracy of their forecasts

OR

- 16. a) The following table represents the sales data of milk (in litres) sold by a milk booth.

Month	1	2	3	4	5	6	7	8
Sales	90	106	92	114	108	98	99	115

(10)

Compute a 3-month moving average forecast for months 4 through 9. Compute a weighted 3-month moving average forecast for months 4 through 9. Assign weights of 0.50, 0.30, and 0.20 to the months in sequence, starting with the most recent month.

- b) Can you determine which of the two forecasts is more accurate by calculating the Mean Absolute Deviation (MAD) for each of them? (4)

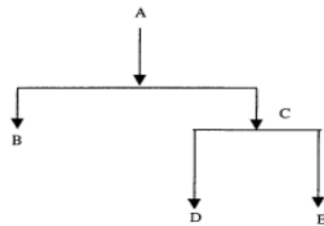
MODULE IV

- 17. a) Explain what aggregate planning aims to achieve and identify situations where it is particularly beneficial. (7)
- b) How did the concept of manufacturing resource planning (MRP II) evolve from the original material requirements planning (MRP) system? What are the key factors that contributed to this evolution in the field of production and operations management? (7)

OR

- 18. Given the following Product structure, BOM, MPS and inventory status, compute MRP tables for all items.

(Product Structure)



(Bill of materials)

Part	Order quantity	Lead time (weeks)	Inventory on hand
A	350	1	220
B	400	2	250
C	800	1	120
D	850	1	105
E	250	1	250

(14)

(Master Production Schedule)

Month	1	2	3	4	5	6
Demand	200	-	-	240	150	220

MODULE V

19. a) Define scheduling. Explain the various performance measures associated with scheduling? (6)
- b) Enumerate the process involved in McNaughton's algorithm, highlighting the significance of each step in determining the critical path within a project network? (8)

OR

20. Consider the following n jobs parallel identical machines problem.

Job (j)	1	2	3	4	5	6	7	8	9
t_j	5	22	15	6	24	19	20	10	7
w_j	3	2	4	2	4	3	1	2	1

 (14)

Find the schedule which will minimize the weighted mean flow time, if the number of parallel identical machines is three.
