

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: BTECH  
BRANCH: PIE**

**SEMESTER : IV  
SESSION : SP/2025**

**SUBJECT: PE218 PRODUCTION & OPERATIONS MANAGEMENT**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
- 

		CO	BL																												
Q.1(a) What are the differentiating characteristics of services when compared to those of manufacturing? What are the implications of these differences relative to managing operations?	[4]	1	1																												
Q.1(b) What are economies of scale and productivity? How do they relate?	[3]	1	2																												
Q.1(c) Discuss the characteristics of manufacturing processes for consideration in the selection.	[3]	1	2																												
Q.2(a) Define the role of the tracking signal in forecasting. What is significance of positive and negative tracking signal. Given the following data, compute the tracking signal and decide whether the forecast should be reviewed.	[5]	2	4																												
<table style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 15%; text-align: center;">Actual</th> <th style="width: 15%; text-align: center;">Forecast</th> </tr> <tr> <th style="text-align: left;">Month</th> <th style="text-align: center;">Sales</th> <th style="text-align: center;">Sales</th> </tr> </thead> <tbody> <tr><td>1</td><td style="text-align: center;">8</td><td style="text-align: center;">10</td></tr> <tr><td>2</td><td style="text-align: center;">11</td><td style="text-align: center;">10</td></tr> <tr><td>3</td><td style="text-align: center;">12</td><td style="text-align: center;">10</td></tr> <tr><td>4</td><td style="text-align: center;">14</td><td style="text-align: center;">10</td></tr> </tbody> </table>		Actual	Forecast	Month	Sales	Sales	1	8	10	2	11	10	3	12	10	4	14	10													
	Actual	Forecast																													
Month	Sales	Sales																													
1	8	10																													
2	11	10																													
3	12	10																													
4	14	10																													
Q.2(b) What is aggregate planning? Briefly discuss various aggregate planning strategies and their advantages and disadvantages.	[5]	2	3																												
Q.3(a) Processing times (including setup times) and due dates for six jobs waiting to be processed at a work center are given in the following table. Determine the sequence of jobs, the average flow time, average tardiness, and average number of jobs at the work center, for each of these rules: a. FCFS    b. SPT    c. EDD	[5]	3	4																												
<table style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Job</th> <th style="width: 15%;">Processing Time (days)</th> <th style="width: 15%;">Due Date (days)</th> <th style="width: 15%;">from present time)</th> </tr> </thead> <tbody> <tr><td>A</td><td style="text-align: center;">2</td><td style="text-align: center;">7</td><td></td></tr> <tr><td>B</td><td style="text-align: center;">8</td><td style="text-align: center;">16</td><td></td></tr> <tr><td>C</td><td style="text-align: center;">4</td><td style="text-align: center;">4</td><td></td></tr> <tr><td>D</td><td style="text-align: center;">10</td><td style="text-align: center;">17</td><td></td></tr> <tr><td>E</td><td style="text-align: center;">5</td><td style="text-align: center;">15</td><td></td></tr> <tr><td>F</td><td style="text-align: center;">12</td><td style="text-align: center;">18</td><td></td></tr> </tbody> </table>	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				
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																													
Assume jobs arrived in the order shown.																															
Q.3(b) There are five jobs (namely 1,2,3,4, and 5), each of which must go through machines A, B and C in the order ABC. Processing times (in hours) are given below:	[5]	3	5																												
<table style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Jobs</th> <th style="width: 10%;">1</th> <th style="width: 10%;">2</th> <th style="width: 10%;">3</th> <th style="width: 10%;">4</th> <th style="width: 10%;">5</th> </tr> </thead> <tbody> <tr><td>Machine A</td><td style="text-align: center;">3</td><td style="text-align: center;">7</td><td style="text-align: center;">5</td><td style="text-align: center;">6</td><td style="text-align: center;">7</td></tr> <tr><td>Machine B</td><td style="text-align: center;">5</td><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">9</td><td style="text-align: center;">5</td></tr> <tr><td>Machine C</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">4</td><td style="text-align: center;">5</td><td style="text-align: center;">3</td></tr> </tbody> </table>	Jobs	1	2	3	4	5	Machine A	3	7	5	6	7	Machine B	5	7	6	9	5	Machine C	2	1	4	5	3							
Jobs	1	2	3	4	5																										
Machine A	3	7	5	6	7																										
Machine B	5	7	6	9	5																										
Machine C	2	1	4	5	3																										

Find the sequence that minimizes the total elapsed time required to complete the jobs.  
Find the total elapsed time and idle time of each machine.

- Q.4(a) How the fixed-interval model is different from the fixed quantity model [2] 4 2
- Q.4(b) A toy manufacturer uses 48,000 rubber wheels annually for its popular dump truck series. [4] 4 4  
 The firm makes its wheels, which it can produce at 800 per day. The toy trucks are assembled uniformly throughout the year. Carrying cost is \$1 per wheel per year. The setup cost for a production run of wheels is \$45. The firm operates 240 days per year. Determine the following:  
 a. Optimal run size  
 b. Minimum total annual cost for carrying and setup  
 c. Cycle time for the optimal run size  
 d. Run time
- Q.4(c) Children's art sets are ordered once each year by Ashok Kumar, Inc., and the reorder point, without safety stock (dL) is 100 art sets. Inventory carrying cost is \$10 per set per year, and a stockout costs \$50 per set per year. Given the following demand probabilities during the lead time, how much safety stock should be carried? [4] 4 4
- | Demand during Lead Time | Probability |
|-------------------------|-------------|
| 0                       | .1          |
| 50                      | .2          |
| ROP : 100               | .4          |
| 150                     | .2          |
| 200                     | .1          |
|                         | 1.0         |
- Q.5(a) A restaurant uses an average of 50 jars of a special sauce each week. Weekly usage of sauce has a standard deviation of 3 jars. The manager is willing to accept no more than a 10 percent risk of stockout during lead time, which is two weeks. Assume the distribution of usage is normal. Determine the ROP. For a probability of 0.9  $z=1.28$ . [2] 5 4
- Q.5(b) Explain ABC analysis. Why does the service level of inventory increase from D to V and from A to C in the combined ABC-VED analysis? [3] 5 4
- Q.5(c) Discuss various tangible and intangible factors of Global plant location. [5] 5 5

:::::29/04/2025 M:::::