QP Code : 15404

(3 Hours) [Total Marks : 100

N.B : (1) Question No. **1** is **compulsory**.
   (2) Attempt any **four** questions from remaining **six** questions.
   (3) Assume suitable data wherever necessary.
   (4) **Figures** to the **right** indicate marks.

1. Solve any **four** of the following :- 20
   (a) What are the different techniques of Shop Floor Control and how are they used to solve production problems?
   (b) What are the seven wastages of JIT? How does the Kanban system help in applying JIT to any production process?
   (c) Where does Bill of Materials (BOM) figure in the MPC framework? Write about BOM and its usage in MPC.
   (d) Write about the different aggregate planning strategies used by manufacturing companies for production of different components.
   (e) Write about the various costs associated with inventory control.
   (f) Create a MRP record and describe its various components.

2. (a) Four different types of jobs go through five machines in the order of   10
   Blanking → Piercing → Grinding → Soaking → Coating (passing is not allowed). Find the optimal sequence where the processing times (in minutes) of each job at the different machines is given in the table below.

| | JOBS | | | |
MACHINES	1	2	3	4
Blanking	6	5	4	7
Piercing	4	5	3	2
Grinding	1	3	4	2
Soaking	2	4	5	1
Coating	8	9	7	5

Determine the total elapsed time and also find the idle time of each machine.

   (b) A department head has 6 jobs and 5 workers. The workers differ in their efficiency   10
   and the job differ in their intrinsic difficulty. The department head estimates the time(in minutes) each worker would take to perform each job as given in the table below.

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Correction Attached

[TURN OVER

Worker	JOBS					
	P	Q	R	S	T	U
1	20	15	26	40	32	12
2	15	32	46	26	28	20
3	11	15	2	12	6	14
4	8	24	12	22	22	20
5	12	20	18	10	22	15

Only one job can be assigned to one worker. Determine how the jobs should be allocated so as to minimize the total work hours. Also find total work hours.

3. (a) The ABC company has recorded the following data for one of its new products over a six month period.   10

Month	Demand (in units of product)
Jan	40
Feb	70
Mar	60
Apr	120
May	100
Jun	90

   (i) What would the forecast be for all the months, if exponential smoothing method is used, with a = 0.2 and forecast for January of 30 units

   (ii) What would the forecast for May have been, if made at the end of April, using a four month moving average.

   (iii) What would be the mean absolute deviation (MAD) for all the six months using the forecasts obtained by the exponential smoothing method as used above.

   (b) Solve the following problem by using the Big M method :   10

   Maximize $Z = 4x_1 + 5x_2 - 3x_3$

   Subject to: $x_1 + x_2 + x_3 = 10$

   $x_1 - x_2 \geq 1$

   $2x_1 + 3x_2 + x_3 \leq 40$

   $x_1, x_2, x_3 \geq 0$

4. (a) A chemical company makes 2 chemical compounds, Citron and Carzon and has a total production capacity of 9 tons per day. The company has to supply at least 2 tons of Citron and atleast 3 tons of Carzon per day to another company. Each ton of Citron requires 20 machine hours production time and each tone of Carzon requires 50 machine hours production time. The daily maximum possible number of machine hours is 360 hours. The profit made by selling Citron is ₹ 80/ton and ₹ 120/ton for Carzon. Determine the production schedule to produce maximum profit using graphical method and also find its profit   **10**

(b) A wholesale distributor has an annual requirement of 15000 bottles of a certain type. Each bottle costs ₹ 70. The bottle manufacturer offers a discount of 10% if 1500 or more bottles are ordered. The ordering cost is ₹ 500 per order and inventory carrying cost is 15%. Comment on whether the distributor should accept the discount.   **10**

5. (a) A manufacturing company produces a certain gearbox component and wants to develop an aggregate plan for 6 months. The following production information is available.

Month	Jul	Aug	Sep	Oct	Nov	Dec
Demand	3500	3700	3900	4000	3400	3600
Working day	25	23	21	24	23	22

Production Details: Safety Stock of 200 units per month, Beginning inventory of 500 units, No. of workers is 20, labor hours required is 10 hrs/unit, Materials cost is ₹ 100/unit, Inventory carrying cost is ₹ 100/unit/month, Cost of shortage is ₹ 200/unit/month, Cost of subcontracting is ₹ 500/unit, Hiring and training costs is ₹ 250/worker, Layoff cost is ₹ 400/worker, regular production time labor cost (first 8 hours) = ₹ 20/hour. Overtime cost is ₹ 30/hour.

Determine the total production cost of using constant workforce and using subcontracting only and not carrying forward any excess inventory (include material production costs also).

(b) Create the MRP plan(8 Weeks) for the production of a compo'nent with the requirements shown below.   **10**
- Lot size = 200 units and lead time of 1 week and safety stock = Zero units.
- Weekly requirements: week 1 = 50 units, week 2 = 150 units, week 3 = 180 units, week 4 = 80 units, week 5 = 12.0 units, week 6 = 220 units and week = 150 units.
- Inventory on hand = 210 units

If the inventory on hand changes to 60 units and a scheduled receipt of 100 units is expected to arrive in week 2, redraw the MRP plan and recalculate the table.

6. (a) Describe all the aspects of capacity planning with reference to MPC. 10

(b) The ford car company has three plants at locations in Chennai, Naida and Hyderabad 10 which supply to warehouses in Delhi, Mumbai, Kolkata, Nagpur and Bangalore. Monthly plant capacities are 800, 500 and 900 units. Monthly warehouse capacities are 400, 400, 500, 400 and 800 units resectively. Unit transportation costs (in ₹) are given below.

	Delhi	Mumbai	Kolkata	Nagpur	Bangalore
Chennai	5	8	6	6	3
Noida	4	7	7	6	5
Hyderabad	8	4	6	6	4

Determine an optimum distribution for the company in order to minimize the total transportation costs.

7. (a) For the project tasks given below, draw the complete network and determine the 10 critical path and its duration Also find the values of total floats for each activity.

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Preceding Activity	-	-	-	A	A	B, D	C	A	C	C	E, F, G	H, I	L	J, K
Activity Duration	3	5	6	7	4	2	4	6	5	7	4	6	3	3

(b) How do Lean and Agile Manufacturing increase the efficiency of current 5 manufacturing industries?

(c) What are the applications, advantages and limitations of using Simulation? What is 5 Monte Carlo Simulation?

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Q.5 (b) Make the following necessary corrections:

(i) Read **"week 5 = 120 units"** instead of "week 5 = 12.0 units"

(ii)Read **"week 8 = 150 units"** instead of "week = 150 units"

(iii)Consider **"week 7 = 0 units"**

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