P09/MU2401/EE/20110515

Time : Three Hours **Marks : 100**

Instructions to Candidates :

1) There are **two** sections.
2) Section I carries **60** marks and Section II carries **40** marks.
3) There are 6 questions in Section I out of which **any four** are to be attempted.
4) The case study question in Section II is **compulsory.**
5) Figures to the right indicate full marks.
6) Answers to the two sections should be written in **one** and the **same** answer book.

SECTION I

1. Discuss the importance of manufacturing strategy. **15**

2. List the information which needs to be included in the competitor's profile while describing the competitor. **15**

3. Briefly describe the different process types. **15**

4. Give reasons for the downsizing of an organization. **15**

5. What are the factors on which the decision to make or buy a part of the product depends. **15**

6. List the departments and processes in the computer integrated manufacturing model. **15**

SECTION II

7. Read the following case and answer the questions that follow :

ABC Corporation was established in 1986 by three Taiwanese immigrants in the USA. By 1990, ABC was an award-winning printed circuit board contractor with an annual turnover of US$ 13.5 million and had built a good reputation among clients like IBM, Sun Microsystems and Silicon Graphics. As the business grew, the company employed 300 people from over 30 different countries.

In 1991, the demand for high-tech hardware plummeted. At that time, the only way to survive was to cut costs. Nevertheless, ABC decided not to reduce staff since the management treated the employees as their biggest asset. In an attempt to cut costs, they turned to the Japanese experience.

In August 1991, the managing director and five managers visited XYZ Electronic, a Japanese company engaged in a similar business. There, they were astonished by the cleanliness and neatness of the factory floor and the impact of overall organization on employees' performance. The secret was in the 5-S system, the principles of which are basic for further quality improvement. The workers understood the importance of instilling the 5-S in their personal lives as well. All in all, contributed to the improvement of interpersonal relationships across the company.

The team from ABC was impressed and decided to launch a similar practice back in their own company. Although there was a certain amount of scepticism towards the 5-S, a typical reaction of an individualistic culture, the results were encouraging. One of the assembly line workers explained the impact of the 5-S implementation. 'This is a good system. Everybody knows what the problems are and how to fix them.' They all emphasized the importance of the organization, its cleanliness and discipline for a good atmosphere and mutual support in the factory. The 5-S system set different sets of rules from the previous practice but it made people more of a team. As another worker stated, 'Before the 5-S, we just worked. Now, we try to improve our work.'

Just two years after the 5-S came to ABC, productivity has skyrocketed by over 26 percent, with turnover exceeding US$ 23 million. This result proves that the 5-S culture is universal and can be related to any working environment if there is a commitment to the common objective.

Questions :

a) Discuss the hurdles that ABC corporation would have faced in implementing '5-S'. **20**

b) How would the productivity of ABC corporation have improved by the implementation of the 5-S system? **20**

P09/MU2402/EE/20110516

Time : Three Hours **Marks : 100**

Instructions to Candidates :

1) There are **two** sections.
2) Section I carries **60** marks and Section II carries **40** marks.
3) There are 6 questions in Section I out of which **any four** are to be attempted.
4) The case study question in Section II is **compulsory.**
5) Figures to the right indicate full marks.
6) Answers to the two sections should be written in **one** and the **same** answer book.

SECTION I

1. Why is sustainable improvement and growth more important for organizations? **15**

2. What do you understand by promotional mix? **15**

3. Direct and fixed costs need to be managed differently. Discuss. **15**

4. How should managers handle demand turbulence in order to optimize inventory? **15**

5. What do you by understand continuous learning? How can a manager contribute towards it in the role of a coach? **15**

6. What do you understand by quality? What are the different stages in the evolution of quality management? **15**

SECTION II

Case Study

7. Read the given case and answer the following questions :

Survival Tactics - Artic Mysore

Anita Lab was set up in 1965 for manufacturing pharmaceuticals on the most modern lines at Mysore. The organization was a partnership firm with N. N. Kelkar and C. K. Moolchandani as its partners. The firm was managed profitably for twenty years by the two partners. However, in 1985, the firm faced some labour problems which adversely affected its performance. It also started facing competition from other pharmaceutical companies which entered the market with up-to-date technology and better products. As a result, the firm had declining profits and a shrinking market share. The partners tried to upgrade the existing technology and improve industrial relations in the plant, but due to financial constraints and the inability to solve labour problems, they finally decided to sell the plant. In 1990. Etech, a multinational group, took over the plant. The name of the plant was changed from the Anita Lab to Avon Drug House (ADH). Despite the best efforts of ADH, the plant remained unviable and Etech was forced to sell it in 1994 to Artic Laboratories.

Artic Laboratories is a multinational group with a turnover of Rs. 500 crore. The company is involved in the manufacture and formulation of drugs and chemicals. Its corporate office is in Mumbai and has a manpower of 112 senior executives, 78 middle-level executives and 360 workers. It has three plants situated at Mumbai, Bangalore and Mysore. The total production capacity of the company is around 280 tonnes per month. The company is a leading exporter of pharmaceuticals and exports 70 per cent of its production.

After Artic took over the ADH Mysore plant, it invested around Rs. 2 crore in the upgradation of the plant. The plant manufactures Rifanipicin, and within no time, this plant became the largest plant in India manufacturing this drug. The labour problems that were plaguing the plant prior to the takeover by Artic, were largely resolved. The reason being that the new management offered better working conditions to the workers and, second, the trade union by now had realized that if it took an unsupportive stand, the future of the plant could be jeopardized.

The plant saw a turnaround due to technology upgradation,

employee support and efficient management and recorded substantial profits. In 1997, Artic started facing competition from China in the domestic and foreign markets. Chine started bulk production of Rifanipicin, which was the main product being manufactured by Artic at Mysore. The competition was due to two reasons.

1. Foreign Markets : China, due to mass production, was able to supply the drug in the international market at a highly competitive price of $100 per ton as against $110 per ton by Artic.

2. Domestic Markets : Economic liberalization in India led to the lowering of import and customs duties, hence, China was able to export to India at a lower landed cost than before.

Although Artic had better quality products as compared to China to meet the competition, the company had to lower its sales price in both the domestic and foreign markets. This resulted in the company experiencing a narrowing in profit margins. Other competitors like Tata Pharma also experienced the same problems and were forced to close down.

The company started finding it unviable to continue production. B. R. Arora, who was in charge of operations at the Mysore plant, advised the top management that the plant should be closed. However, J. N. Bhatia, Vice President Technical, who was a chemical engineer from IIT Chennai and had successfully revived a plant prior to joining Artic, was asked to explore the status. Bhatia analyzed the situation in a systematic manner. He conducted interviews in various departments and submitted a report with the following recommendations :

- Improve technology
- Increase production capacity
- Lower overhead costs

The head office took the following steps on Bhatia's recommendations :

- To improve technology, an R&D team from the head office was sent to Mysore. After eight months of experimentation, the team was able to develop a modified process of manufacturing which improved raw material utilization. During this period, the plant operated at a very low production level.

- To increase production, rescheduling of the operational shifts was done which resulted in thirty working days as compared to the earlier twenty-six working days in a month. This was possible due to the full cooperation extended by the workforce.

1 A large component of overhead costs was raw materials which was greatly reduced due to the new manufacturing process developed by the R&D efforts.

Due to all these efforts, Artic Mysore was able to become cost effective without compromising on its high quality. It was able to turn around and was soon on the road to recovery. It soon produced 60 per cent of the drugs manufactured in the country and exported to 50 countries. The company decided on plant expansion by using automated machines and aspired to be the best in Asia.

Questions :

a) As the company depended on the international market for consumption of 70 per cent of its production, what were the factors which affected its existing and future market penetration? **10**

b) What should have been the strategy of the company to sustain the profitability of the company? **15**

c) Suggest any two recommendations that could have revived the plant in addition to the recommendations made by Bhatia. **15**

P09/MU2403/EE/20110518

Time : Three Hours **Marks : 100**

Instructions to Candidates :

1) There are **two** sections.
2) Section I carries **60** marks and Section II carries **40** marks.
3) There are 6 questions in Section I out of which **any four** are to be attempted.
4) The case study questions in Section II are **compulsory.**
5) Figures to the right indicate full marks.

SECTION I

1. Explain the role of production planning and control in the engineering industry. **15**

2. Describe the term aggregate capacity planning. Also explain the features and need for aggregate capacity planning. **15**

3. Define a linear programming problem and explain in detail, all methods of solving them. **15**

4. Explain the role of design and marketing departments with respect to the product development process. **15**

5. What is 'JIT' purchasing? Describe the various elements and characteristics of JIT in detail. **15**

6. What is 'job shop'? Explain in detail, the job shop scheduling. **15**

SECTION II

7. A company produced a product, P-1. The production process of the product P-1 includes six different activities, A1, A2, A3, A4, A5 and A6. The activity, A1 is the starting activity and A6 is the ending activity. Every activity takes two months to complete and starts after the completion of the previous activity. Construct a Gantt chart representing the sequence of all activities. **20**

8. A bakery keeps stock of a popular brand of bread. Daily demand of the bread is given below in the table. **20**

Daily demand and probability

Daily demand	0	5	10	15	20	25
Probability	0.01	0.20	0.02	0.15	0.12	0.50

Consider the following sequence of random members from the random number table.

R. No. 78, 51, 48, 15, 56

Using this sequence, simulate the demand for the next five days.

P09/MU2404/EE/20110519

Time : Three Hours **Marks : 100**

Instructions to Candidates :

1) There are **two** sections.
2) Section I carries **60** marks and Section II carries **40** marks.
3) There are 6 questions in Section I out of which **any four** are to be attempted.
4) Section II has **2** questions and **both** are **compulsory.**
5) Figures to the right indicate full marks.
6) Answers to the two sections should be written in **one** and the **same** answer book.

SECTION I

1. Define the term, 'material management'. What are the objectives and functions of material management? **15**

2. What are the functions of an inventory? What do you understand by inventory control? Explain the reason for its importance in the present economic conditions. **15**

3. Describe the technique of Material Requirement Planning (MRP) with illustrative examples. **15**

4. Explain what is a 'bill of material' and how it is modularized in MRP. **15**

5. What is capacity requirement planning? How will you plan the capacity requirements using the MRP system? **15**

6. What are the objectives and functions of production control? **15**

SECTION II

7. Enumerate the various lot-sizing techniques and explain why these techniques are useful in an MRP system. **20**

8. What is the future of the MRP system? Also explain in detail, the developments that have taken place in MRP. **20**

P09/MU2405/EE/20110519

Time : Three Hours **Marks : 100**

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5) Figures to the right indicate full marks.
6) Answers to the two sections should be written in **one** and the **same** answer book.

SECTION I

1. What are the major elements of logistics cost? Describe how they could be leveraged for competitive advantage? **15**

2. Explain the relevance of the product life cycle in determining the logistics requirements during the life cycle of a product. **15**

3. What do you understand by total transportation cost? How does it differ from the freight cost? **15**

4. What is the role of information technology in logistics? What are the benefits of the same? **15**

5. What functions does a warehouse perform in a logistical system? What are the benefits of the same. **15**

6. In what respects does supply chain management differ from logistics? **15**

SECTION II

7. A product is manufactured by four factories A, B, C and D. The unit production costs are Rs. 2, Rs. 3, Rs. 1 and Rs. 5 respectively. Their daily production capacities are 50, 70, 30 and 50 units respectively. These factories supply the product to four stores P, Q, R and S. The demand made and the stores are 25, 35, 105 and 20 units respectively. Unit transportation cost in rupees from each factory to each store is given in the following table : **40**

Particulars	Stores			
	P	Q	R	S
Factory A	2	4	6	11
Factory B	10	8	7	5
Factory C	13	3	9	12
Factory D	4	6	8	3

Determine the extent of deliveries from each of the factories to each of the stores so that the total cost (production and transportation together) is the minimum.

(Marketing) was also away from the customers of late, he felt that by cutting down prices it might help to regain the market. He, of course, urged CEO to call the new Head of Q.C. and impress upon him about maintaining quality. Q.C. Chief assured CEO that he would do everything in his power to maintain quality and customers would not have any scope for complaint in future. The CEO felt assured and thanked Q.C. Chief.

However, this move by the company did not yield much result. The customers did not complain, but did not buy much either. Price realization dipped and GM (Finance) started complaining. Pressure was built on works to cut down cost, and marketing to cut down sales expenditure. Works found it difficult to cut cost further due to recent increase in raw material cost and labour wage hike. CEO did not know where to go from here. He once felt to put an all-out thrust for customer contact and to understand why the market is shying away from them, but GM (Marketing) was not that keen. He felt that would be taken as a weakness on their part and customers may force the price down further. So, TM&F took a cautions approach towards customer contact, but that was not enough.

Meanwhile, the project of M/s SS&F was completed before the scheduled time, and they started manufacturing from this plant. The new products were far superior to the older design, and the capacity was high enough to feed 80% of the market demands. Encouraged by product quality and customer awareness of their capability, the head of SS&F invited a select group of high-end consumers to visit their new plant. He personally gave them the round and asked the new project manager to give a technical presentation of the new products and advantages of using them for sophisticated industrial construction. He had also invited the

manager of the venture capital fund to meet this select group of consumers. Consumers were very happy and expressed their confidence in SS&F's products. This was the beginning of new era of SS&F's business. The Head was invited to contribute an article in a widely read newspaper in their special consumer page for the construction industry. Workmen in the company felt proud of their jobs and company. The next two years saw their sales revenue doubling to several hundred crores, and profit increasing by over 40% of the earlier year.

At M/s TM&F, the situation was reverse; their sales started dropping year by year and many skilled employees started leaving the company. Customers who were loyal to TM&F for decades found it difficult to stick to them. These customers also started buying from SS&F for their high-end applications. Soon, SS&F became the number one company in the country in their business.

The year 2001 became memorable of SS&F; they were awarded the certificate of the 'Best Managed Company' in the medium sector of engineering products by the president of the largest Chamber of Commerce in the country. They started test marketing their products abroad in 2001, especially in the middle-east countries, and soon their products became the most sought after in those countries. In February, 2003, the company was recognised by the Government for their superior export performance.

Soon after this award was announced, the head of SS&F met the CEO of TM&F in a regional meeting of the Association of Industries. This was their first meeting. They shook hands and formally looked at each other, but the CEO was a bit unmindful... he could hear the bell softly ringing in the nearby distance.

Questions :

1. Critically comment on the managerial style of the CEO of M/s TM&F. Identify three important areas where he faltered when compared to TQM practice. 10

2. 'TQM relies on continuous improvement and ability to learn to change'. Comment on the performance of both the companies with respect to this statement. 10

3. Summarize the learning points from this case study. 10

4. Based on this case study, justify the statement that TQM stands on the tripod of customer, leader and the people of the organization. 10

P09/MU2407/EE/20110520

Time : Three Hours **Marks : 100**

Instructions to Candidates :

1) There are **two** sections.
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5) Figures to the right indicate full marks.
6) Answers to the two sections should be written in **one** and the **same** answer book.

SECTION I

1. What is the scope of operations research in the field of production management? **15**

2. Explain the use of sensitivity analysis with the help of an example. **15**

3. Explain the concept of inventory control. Calculate the EOQ from the following data. **15**

Price of item	Rs. 30/- each
Ordering cost per year	Rs. 1,64,000/-
No. of orders placed per annum	8200 orders
Inventry carrying cost	20% p.a.
Annuals requirement	14,40,000
Lead time	1 month

4. Explain the operating characteristics of the quening system. **15**
Solve the following problem :

There are two clerks in a university to receive dues from the students. If the service time for each student is exponential with mean 14 minutes and if the boys arrive in a Poisson fashion at the counter at the rate of 15 per hour, determine :

a) Probality having to wait for the service
b) Expected percentage of idle time of each clerk

5. What do you mean by the replacement theory? Discuss the optimal replacement policy. **15**

6. Describe the concept of dynamic programming. What are the functions and characteristics of dynamic programming? **15**

SECTION II

7. What is meant by optimistic time in PERT? Solve the following example. **20**

Assuming that the expected times are normally distributed, find the probality of meeting the schedule date as given for the network.

The table shows the necessity data for calculations.

Table activity time

Activity	Days		
	Optimistic	Most likely	Pessimistic
a	A	m	b
1–2	2	5	14
1–3	9	12	15
2–4	5	14	17
3–4	2	5	12
4–5	6	6	12
3–5	8	17	20

The schedule project completion date is 30 days. Find the date on which the project manager can complete the project with a probability of 0.90.

8. Where is dynamic programming useful? Solve the following. **20**

Max $Z = 3x + 2y$

Subject to $x + y \leq 300$

$2x + 3y \leq 800$

$x, y \geq 0$

Max $Z = 3x + x^2$

Subject to $2x_1 + x_2 \leq 6$

$x_1 \leq 2$

$x_2 \leq 4$

$x_1, x_2 \leq 0$

4,320

P09/MU2408/EE/20110521

Time : Three Hours | Marks : 100

Instructions to Candidates :

1) There are **two** sections.
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4) The two questions in Section II are **compulsory.**
5) Figures to the right indicate full marks.
6) Answers to the two sections should be written in **one** and the **same** answer book.

SECTION I

1. Which factors should be considered necessary by a project manager while selecting a project? **15**

2. Describe the characteristics and different principles of project management. **15**

3. Discuss the importance of plant location and explain how Government policies affect the location analysis? **15**

4. A small maintenance project consists of the following jobs whose precedence relationships are given in table 1 **15**

Table 1 - Precedence relationships

Job	1–2	1–3	2–3	2–5	3–4	3–6	4–5	4–6	5–6	6–7
Duration (days)	15	15	3	5	8	12	1	14	3	14

a) Draw an arrow diagram representing the project.

b) Find the total float for each activity.

c) Find the critical path and the total project duration.

5. What are the basic considerations for material handling? Also explain the various equipments that are used in material handling. 15

6. Following table shows a transportation table. Find the initial solution with the help of the least cost method. 15

Origin/Destination	D_1	D_2	D_3	D_4	Supply
Q_1	1	3	4	2	8
Q_2	5	4	3	0	6
Q_3	2	4	3	1	10
Demand	4	7	6	7	24

SECTION II

7. The company ABC produces products that have a seasonal demand pattern. The table shows the available production capacities during regular time and overtime. 20

Period	Regular time	Overtime	Sub-contract
1	1100	450	800
2	1200	450	800
3	1500	450	800
4	800	450	800

The table shows the demand forecast.

Period	1	2	3	4
Unit of demand	900	1200	2400	1500

The table shows the cost data.

Available initial inventory	350 units
Regular time cost / unit	Rs. 150
Subcontracting cost / unit	Rs. 195
Desired final inventory	180 units
Overtime cost / unit	Rs. 170
Inventory cost / unit / period	Rs. 25

Determine the optimum production level and means of production for the next four quarter periods by formulating the problem as a transportation problem.

8. The following data pertains to the manufacturing activities of a product. **20**

Activity	Time in weeks	Activity	Time in weeks
1–2	2	4–7	6
2–5	4	5–6	8
1–3	4	6–8	4
3–6	9	7–8	7
1–4	2	8–9	4

From above data, answer the following :

a) Draw a PERT network.

b) Identify the critical path and calculate the total time required to complete the project.

c) If activity 3–6 takes 12 weeks and 2–5 gets delayed by another one week, what will be the revised critical path?

d) If activities 2–5, 3–6, and 4–7 can be reduced by 1 week each at an extra cost of Rs. 1,000/- per week, which activities should be reduced and why?