P-9: OPERATIONS MANAGEMENT AND STRATEGIC MANAGEMENT

SUGGESTED ANSWERS

SECTION – A

1.

(i) (A)

(ii) (B)

(iii) (B)

(iv) (A)

(v) (B)

(vi) (C)

(vii) (B)

(viii) (A)

(ix) (C)

(x) (C)

(xi) (A)

(xii) (B)

(xiii) (B)

(xiv) (C)

(xv) (B)

SECTION – B

2. (a)

The Major important decision areas under production and operations Management are aligned below:

(i) Product Selection

(ii) Facility Location Selection

(iii) Demand Forecasting

(iv) Process selection & Layout decision

(v) Capacity planning

(vi) Aggregate Planning, Master production schedule

(vii) Materials Requirement Planning (MRP) / Manufacturing Resource Planning (MRP I) / Distribution Resource Planning (DRP) / Enterprise Resource Planning (ERP).

(viii) Inventory Management

(ix) Supplier Selection / Sourcing

(x) Process Management

(xi) Quality Management

(xii) Maintenance

(xiii) Warehousing / Transportation

(xiv) Reverse Logistics

In Addition, an operations manager is also responsible for working capital management, skill-management etc.

2. (b)

The three important tools used for increasing productivity in an organization are analyzed as under:

I. Human Aspects:

Under this, cooperation of workers is sought in the following ways:

(i) More workers participation in management or in decision making through joint consultation.

(ii) Improving communication services.

(iii) Improving mutual trust and cooperation through improved job procedures, better training of employees, more workers incentives by implementing various incentive schemes, and labour welfare programmes.

(iv) Better planning of work, more effective management, more democracy in administration, improved human relations and selection and training of personnel at various levels of management are some human efforts from the side of management in order to improve the productivity.

II. Supply of Inputs:

(i) Improvement in the nature and quality of raw materials and their supplies to the work.

(ii) Proper provision of plant, equipment and their maintenance.

(iii) Introduction of more and more machines and equipment in place of physical work.

(iv) Fuller utilization of manpower and efficiency or capacity of plant and equipment employed.

III. Technological Aspects:

Certain methodological and technological developments are also necessary to improve the productivity of the organisation. These are;

(i) Work, time and motion studies to determine better ways and means of doing a job.

(ii) Implementing various simplification, specialization and standardisation programmes.

(iii) Applying control techniques comprising of production, planning and control, cost control and quality control techniques.

(iv) Improving layout of plants, shops and machine tools, and material handling and internal transportation system.

(v) Improving inspection techniques so as to minimise the wastage and defective work.

3. (a)

The basic six types of Production Control are appended below:

(i) Block control:

This type of control is most prominent in textiles and book and magazine printing. In these industries it is necessary to keep things separated and this is the fundamental reason why industries resort to block control.

(ii) Flow control:

This type of control is commonly applied in industries like chemicals, petroleum, glass, and some areas of food manufacturing and processing. Once the production system is thoroughly designed, the production planning and control department controls the rate of flow of work into the system and checks it as it comes out of the system. But, under this method, routing and scheduling are done when the plant is laid out.

(iii) Load control:

Load control is typically found wherever a particular bottleneck machine exists in the process of manufacturing.

(iv) Order Control:

The most, common type of production control is called order control. This type of control is common employed in companies with intermittent production systems, the so-called job-lot shops. Under this method orders come into the shop for different quantities for different products. Therefore, production planning and control must be based, on the individual orders.

(v) Special project control:

Special production control is necessary in certain projects like the construction of bridges, office buildings, schools, colleges, universities, hospitals and any other construction industries. Under this type of control, instead of having sets of elaborate forms for tooling and scheduling, a man or a group of men keeps in close contact with the work.

(vi) Batch control:

Batch control is another important, type of production control which is frequently found in the food processing industries. Thus, production control in batch-system of control operates with a set of production planning and Control in continuous production systems.

3. (b)

(i) The number of hours of operation per year (N):
= 3 x 8 x 5 x 50 = 6000 hours

Requirements of Workstations:

$$\frac{\left[\,DP+(D/Q)\,x\,S\,\right]+\left[\,DP+(D/Q)\,x\,S\,\right]}{N\left[\,1-C\,\right]}$$

$$= \frac{\left[6000\ x\ 20+(6000\ /\ 100)\,x\,2\right]+\left[12000\ x\ 40+(12000\ /\ 100)\,x\,3\right]}{6000\ \ (1-0.19)}$$

$$= \frac{(120000+120)+(480000+360)}{6000x\ 0.81} = \frac{600480}{4860} = 123.56$$

i.e. 124 Workstations

(ii) Additional requirement of Workstations = 124 – 100 = 24 Workstations

4. (a)

Since the number of Jobs are not equal to the number of Machines, a dummy Machine M5 is created. The time (in hours) consumed by any Job for the dummy Machine M5 is 0.

Machine / Job	M_1	M_2	M_3	M_4	M_5
D	8	4	7	4	0
E	4	7	10	9	0
F	9	10	8	11	0
G	8	4	5	6	0
H	11	5	10	11	0

Column Operation

Machine / Job	M_1	M_2	M_3	M_4	M_5
D	~~4~~	~~0~~	~~2~~	~~0~~	~~0~~
E	~~0~~	~~3~~	~~5~~	~~5~~	~~0~~
F	5	6	3	7	0
G	~~4~~	~~0~~	~~0~~	~~2~~	~~0~~
H	7	1	5	7	0

Here minimum no. of Horizontal and vertical Straight lines to cover all the Zeros = 4 < order of Matrix (5), so, Solution is not optimal.

Subtract 1(minimum value) from every uncovered value and add 1 to every value at the intersection of two lines. Draw the number of lines to cover all Zeros.

Improved Matrix

Machine / Job	M_1	M_2	M_3	M_4	M_5
D	~~4~~	~~0~~	~~2~~	~~0~~	~~1~~
E	~~0~~	~~3~~	~~5~~	~~5~~	~~1~~
F	4	5	2	6	0
G	~~4~~	~~0~~	~~0~~	~~2~~	~~1~~
H	~~6~~	~~0~~	~~4~~	~~6~~	~~0~~

Here minimum no. of Horizontal and Vertical Straight lines to Cover all the Zeros = 5 order of Matrix.
So, the solution is optimal.

Hence the optimal assignment is made in the matrix below.

Machine / Job	M_1	M_2	M_3	M_4	M_5
D	4	0	2	[0]	1
E	[0]	3	5	5	1
F	4	5	2	6	[0]
G	4	0	[0]	2	1
H	6	[0]	4	6	0

The optimal assignment and corresponding Time are as follows:

Jobs	Machine	Time (in hours)
D	M_4	4
E	M_1	4
F	M_5 (Dummy)	0
G	M_3	5
H	M_2	5
		18

Minimum Time is 18 hours

4. (b):

(i) Random No. Range Table for Demand

Demand per week	Frequency	Probability	Cumulative Probability	Range
0	8	0.16	0.16	00 – 15
5	16	0.32	0.48	16 – 47
10	4	0.08	0.56	48 – 55
15	15	0.30	0.86	56 – 85
20	5	0.10	0.96	86 – 95
25	2	0.04	1	96 – 99
	$\sum f = 50$	1.00		

Simulated Values for next 10 weeks

Weeks	Random Nos.	Demand
1	27	5
2	63	15
3	79	15
4	35	5
5	86	20
6	58	15
7	38	5
8	67	15
9	95	20
10	52	10
	Total	125

(ii) Average Weekly Demand: 125 / 10 = 12.5 Hundred kg. /week

5. (a)

(i) Average number of light bulb to be replaced every month:
Mean time between failures = 0.15 x 1 + 0.15 x 2 + 0.4 x 3 + 0.3 x 4 =2.85 months

Avg. Nos. of bulb = $\frac{1000}{2.85} = 350.88$

(ii) Average monthly cost of individual replacement = 350.88 x 100 = ₹ 35088

(iii) Number of bulbs to be replaced every month:

Month	Bulbs to be replaced
1	1000 x 0.15 = 150
2	1000 x 0.15 + 150 x 0.15 = 172.50
3	1000 x 0.40 + 150 x 0.15 +172.50 x 0.15 = 448.38
4	1000 x 0.30 + 150 x 0.40 + 172.50 x 0.15 + 448.38 x 0.15 = 453.13

All bulbs to be replaced (Group Replacement):

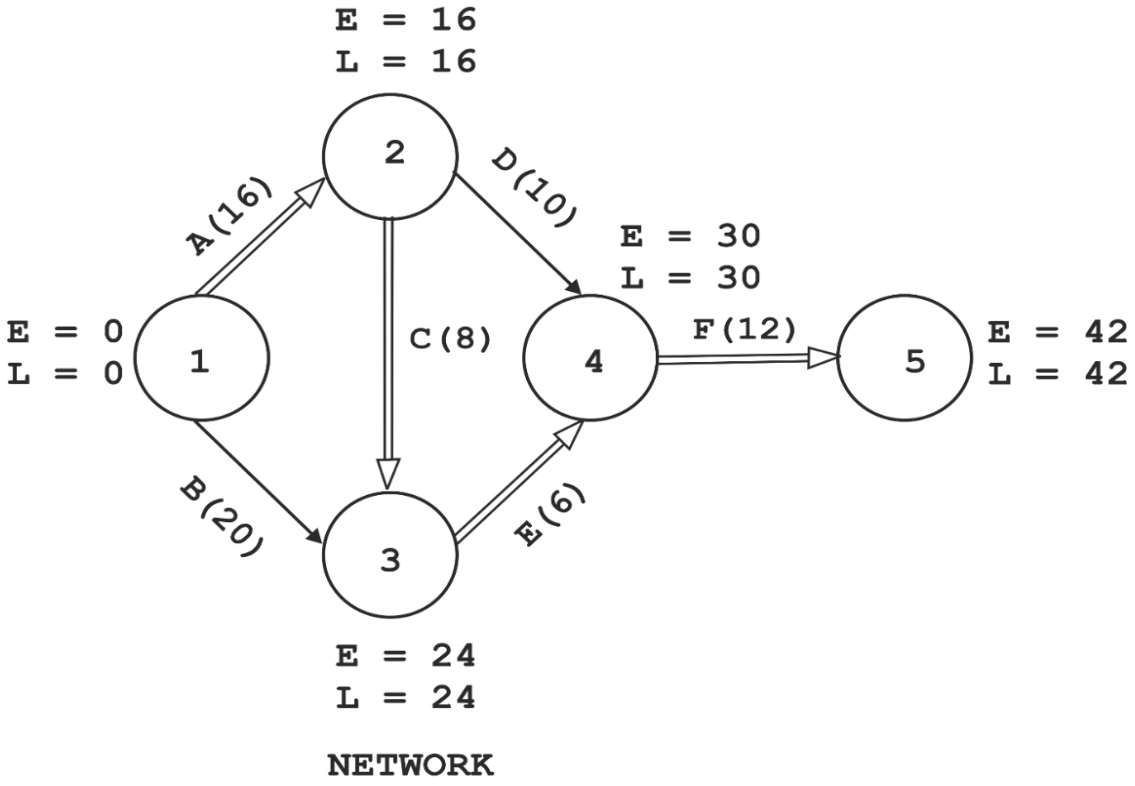
Month	Replacement Cost	Cumulative Replacement Cost	Group Replacement Cost	Total Cost	Average Monthly Cost
	(₹)	(₹)	(₹)	(₹)	(₹)
1.	150 x 100 = 15000	15000	40000	55000	55000
2.	172.50 x 100 = 17250	32250	40000	72250	36125
3.	448.38 x 100 = 44838	77088	40000	117088	39029.33
4.	453.13x100 = 45313	122401	40000	162401	40600.25

Hence all bulbs to be replaced every two months as the average cost per month (36125) is minimum.

(iv) **RECOMMENDATION:**
Since cost of individual replacement is 35088 per month is less than Group (average monthly cost) the policy for individual replacement of bulbs as and when they fail will be economical.

5 (b):

(i)



NETWORK

(ii) Critical Path: A $\rightarrow$ C $\rightarrow$ E $\rightarrow$ F (1 – 2 – 3 – 4 – 5)

(iii) Minimum Time (in days) for completion of the project is = (16 + 8 + 6 + 12) = 42 Days

(iv) Total float, free float and Independent float for each activity

Activity & Identification		Normal time (Days)	EST	EFT	LST	LFT	Total Float	Free Float	Independent Float
A	(1 – 2)	16	0	16	0	16	0	0	0
B	(1 – 3)	20	0	20	4	24	4	4	4
C	(2 – 3)	8	16	24	16	24	0	0	0
D	(2 – 4)	10	16	26	20	30	4	4	4
E	(3 – 4)	6	24	30	24	30	0	0	0
F	(4 – 5)	12	30	42	30	42	0	0	0

6. (a)

The Strategic Management Consists of four basic elements. The four basic elements are appended below:

(i) **Environmental scanning:**

It refers to the monitoring, evaluating and disseminating of information from the external and internal environments to key people within the organisation. The purpose is to identify the strategic factors both internal and external elements that will shape the future of the organisation. The range of methods and techniques available for environmental scanning is wide. There are formal and systematic techniques as well as intuitive methods available.

(ii) **Strategy Formulation:**

It refers to the development of long-range plans for the effective management of environmental opportunities and threats, in the light of corporate strengths and weaknesses (SWOT). It includes defining the mission, setting objectives, developing strategies and setting policy guidelines.

(iii) **Strategy Implementation:**

It is the process by which strategies and policies are put into practice though the development of programs, budgets and procedures. This includes day to day decisions in resource allocation and is typically conducted by the middle and lower-level managers with review by the top management. It involves taking actions at the functional, business and corporate levels to execute a strategic plan. Implementation include, for example, putting quality improvement programs changing the way product is designed.

(iv) **Evaluation and control:**

It involves the process through which organisational activities and performances are monitored. The actual performances are compared to the desired performances and corrective actions are taken to resolve problems. The process of evaluation and control helps to identify the weakness and lacunae of the previously implemented strategic plan and thereby, stimulates the entire process to begin again.

6. (b)

There are three Levels of Artificial Intelligence (AI)

(I) Narrow AI (II) General AI / human – Level AI and (III) Super AI

(I) Narrow AI:

Narrow AI refers to the current state-of-the-art with existing software that automates a traditionally human activity and often outperforms humans in efficiency and endurance in one specialized area, e.g., forecasting the weather, autonomous driving, etc.

(II) General Al / human-level AI:

General Al / human-level AI describes the capacity of machines to understand their environment and reason and act accordingly, just as a human would in all activities across all dimensions, including scientific creativity, general knowledge, and social skills.

(III) Super AI:

Super AI, the highest level of AI, is reached when AI becomes much smarter than the best human brains in practically every field.

Super AI systems can make deductions about unknown environments.

Analysis of Concepts Machine Learning (ML), Deep Learning and Block Chain:

(IV) Machine learning (ML):

describes automated learning of implicit properties of, or underlying rules for data. It is a major component for implementing AI since its output is used as the basis for recommendations, decisions, and feedback mechanisms with regards to a previously unknown situation.

ML is an approach to creating AI. As most AI systems today are ML-based, the terms are often used interchangeably – particularly in a business context.

ML involves training algorithms on sample input data to optimize its performance on a specific task so that the machine gains a new capability.

(V) Deep learning is a branch of AI:

It mainly deals with neural networks that consist of many layers, hence the name ‘‘deep’’. In the last years, deep neural networks have been the most successful AI approach in many areas.

(VI) Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (house, car, cash, land, etc.) or intangible (intellectual property, patents, copyrights, branding). Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved.

7. (a)

The activities involved in Porter’s Value Chain can be broadly divided into two types namely, primary activities and secondary or support activities.

Primary activities are directly concerned with the creation or delivery of a product or service. For example, for a manufacturing organisation the primary activists are as follows:

(i) Inbound logistics are activities concerned with receiving; storing and distributing inputs to the product or service including materials handling, stock control, transport, etc.

(ii) Operations transform these inputs into the final product or service. Operations include machining, packaging, assembly, testing, etc.

(iii) Outbound logistics collect, store and distribute the product to customers, for example warehousing, materials handling, distribution, etc.

(iv) Marketing and sales provide the means whereby consumers / users are made aware of the product or service and are able to purchase it. This includes sales administration, advertising and selling.

(v) Service includes those activities that enhance or maintain the value of product or service, such as installation, repair, training and spares.

Support activities help to improve the effectiveness or efficiency of primary activities. The following are the support or secondary activities:

(i) Procurement: It refers to the processes that occur in many parts of the organisation for acquiring the various resource inputs to the primary activities.

(ii) Technology development: All value activities have a ‘technology’, even if it is just know-how. Technologies may be concerned directly with a product or with processes or with a particular resource.

(iii) **Human resource management:** This transcends all primary activities. It is concerned with those activities involved in recruiting, managing, training, developing and rewarding people within the organisation.

(iv) **Infrastructure:** The formal systems of planning, finance, quality control, information management, and the structures and routines that are part of an organisation's culture.

7. (b)

Rockart has identified four major sources of Critical Success Factors (CSFs) which are appended below:

(i) **Structure of the Industry:**

Some CSFs are specific to the structure of the industry for e.g., the extent of service support expected by the customers. Automobile companies have to invest in building a national network of authorizes service stations to ensure service delivery to their customers.

(ii) **Competitive strategy, industry position and geographic location:**

CSFs also arise from the above factors for e.g. the large pool of English- speaking manpower makes India an attractive location for outsourcing the BPO needs of American and British firms.

(iii) **Environmental Factors:**

CSFs may also arise out of general / business environment of a firm, like the deregulation of Indian industry. With the deregulation of telecommunication industry, many private companies had opportunities of growth.

(iv) **Temporal factors:**

Certain short-term organisational developments like sudden loss of critical manpower (like the charismatic CEO) or break-up of the family-owned business, may necessitate CSFs like 'appointment of a new CEO' or 'rebuilding the company image'. Temporarily such CSFs would remain CSFs till the time they are achieved.

In the process of developing alternatives, it may be useful to narrow down the range of options by identifying the more promising alternatives, in the light of the Critical Success Factor (CSFs). The options relevant to those factors may be analyzed along with a forecast of their outcome.

8 (a):

According to David (2005) the following are the differences between strategy formulation and strategy implementation:

Strategy Formulation	Strategy Implementation
It involves positioning forces before the action	It involves managing forces during the action.
The focus is on effectiveness.	The focus is one efficiency.
It is primarily an intellectual process.	It is primarily an operational process.
It requires good intuitive and analytical skills.	It requires motivation and leadership skills.
Requires coordination among few individuals.	Requires coordination among many individuals

8. (b)

The guidelines, a strategic Manager should keep in mind while implementing the proper strategic Control are aligned below:

(i) Control should involve only the minimum amount of information needed to give a reliable picture of events: Too many controls create confusion. Focus on the strategic factors by following Pareto's 80/20 rule: Monitor those 20% of the factors determines 80% of the results.

(ii) Control must be reasonable Frequent reporting and rapid reporting may frustrate control.

(iii) Controls do not work unless they are acceptable to those who apply them.

(iv) Controls should monitor only meaningful activities and results, regardless of measurement difficulty. If cooperation between divisions is important to corporate performance, some form of qualitative or quantitative measure should be established to monitor cooperation.

(v) Controls must be flexible to take care of changing circumstances.

(vi) Controls should be timely so that corrective action can be taken before it is too late: Steering controls, controls that monitor or measure the factors influencing performance, should be stressed so that advance notice of problems is given.

(vii) Long-term and short-term controls should be used: If only short-term measures are emphasized, a short-term managerial orientation is likely.

(viii) Controls should aim at pinpointing exceptions: Only activities or results that fall out- side a predetermined tolerance range should call for action.

(ix) Emphasize the reward of meeting or exceeding standards rather than punishment for failing to meet standards. Heavy punishment of failure typically results in go displacement. Managers will fudge reports and lobby for lower standards.