OPERATIONS MANAGEMENT AND STRATEGIC MANAGEMENT

Time Allowed: 1 Hour **Full Marks: 100**

Answer all questions. Each question carries 2 marks.

SECTION – A (Compulsory)

I. Choose the correct option: **[15 x 2 =30]**

(i) Which one of the following is associated with the configuration of departments, work centres and equipment and machinery, with focus on the flow of materials or work through the production system?

a. Facility Location
b. Facility Layout
c. Capacity Planning
d. Process Layout

(ii) Which ISO defines Quality Assurance in Final Inspection Test:

a. ISO 9002
b. ISO 9003
c. ISO 9001
d. ISO 9004

(iii) In a particular plant there are 12 workers manufacturing a single product and the output per month consisting of 25 days of that particular product is 500. How much is the monthly productivity?

a. 20
b. 38
c. 42
d. 50

(iv) Which phase of product life cycle is characterized by Saturation in the market place?

a. Maturity Phase
b. Growth Phase
c. Introduction Phase
d. Decline Phase

(v) Which among the following is not the limitation of Gantt Chart:

a. It does not convey the variability of the task duration, equipment performance, and human potential, any one of which could influence the accuracy of loading the work centres.
b. It clearly indicates the details regarding progress of activities.
c. It does not give a clear indication of the interrelationship between separate activities.
d. The chart is static and must be uploaded periodically to account for new job arrival and revised time estimates for existing jobs.

(vi) Which among the following stands correct for PERT:

a. Time estimate is deterministic with known time duration. Single time estimate.
b. Activity orientation
c. Focused on time
d. More suitable for repetitive projects

(vii) Free float is defined as:

a. Total float by deducting slack time of the head event.
b. Total float by deducting slack time of the tail event
c. Free float by deducting tail slack
d. Free float by adding tail slack

(viii) 'Z' chart is a chart used in:

a. Programme control
b. Job control
c. Cost control
d. Quality control.

(ix) Spares can be classified as per service level:

a. Rotable spares
b. Insurance spares
c. Capital spares
d. All of the above

(x) Frequency of breakdown:

a. Number of break down / Available machine hour
b. Available machine hour /Number of break down
c. Down time due to maintenance / Number of break down
d. Number of break down / Down time due to maintenance

(xi) Which Ocean strategy focus on making the competition irrelevant:

a. Red Ocean Strategy
b. Blue Ocean Strategy
c. Green Ocean Strategy
d. Black Ocean Strategy

(xii) Which among the following are the benefits of having a vision:

a. Good visions are inspiring and exhilarating
b. It represents a discontinuity, a step function and a jump ahead so that the company knows what it is to be.
c. Good visions are competitive, original and unique
d. All the above

(xiii) SMART goal framework does not include:

a. Strategy
b. Measurable
c. Relevant
d. Time Based

(xiv) The characteristics of Business Environment includes:

a. Complex Environment
b. Multi-faceted
c. Dynamic
d. All of the above

(xv) In the context of BPR, what does "reengineering" refers to?

a. Continuously improving existing processes
b. Completely redesigning and reconstructing processes
c. Outsourcing business processes
d. Automating manual tasks

Answer:

i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv
b	b	c	a	b	c	a	c	d	a	b	d	a	d	b

Section – B

(Answer any five questions out of seven questions given. Each question carries 14 Marks)

[5 x 14 = 70]

2. (a) "Recent trends in production and operations management relate to global competition and the impact it has on manufacturing firms." State the recent trends. [7]

(b) Below data are collected related to work study for 150 hrs on a floor shop employing 7 labours having a shift of 8 hrs in a day.

(i) Number of observations documented in total = 3000
(ii) Number of observations in which no working activity is observed = 500
(iii) Manual to machine ratio = 3:2
(iv) Average Rating factor = 120%
(v) Number of product produced during the period of study = 7000

Company has its own policy regarding personal allowance which is pegged at 11% of normal standard time to produce a product.

The floor shop produces 49000 products per month for 24 working days, it has an absenteeism of around 6%.

Calculate efficiency of utilisation of Labour and Productive Efficiency of Labour. [7]

Answer:

(a) Recent trends in production and operations management relate to global competition and the impact it has on manufacturing firms. Some of the recent trends are:

1. **Global Market Place:** Globalisation of business has compelled many manufacturing firms to have operations in many countries where they have certain economic advantage. This has resulted in a steep increase in the level of competition among manufacturing firms throughout the world.
2. **Production/Operations Strategy:** More and more firms are recognising the importance of production/ operations strategy for the overall success of their business and the necessity for relating it to their overall business strategy.
3. **Total Quality Management (TQM):** TQM approach has been adopted by many firms to achieve customer satisfaction by a never-ending quest for improving the quality of goods and services.
4. **Flexibility:** The ability to adapt quickly to changes in volume of demand, in the product mix demanded, and in product design or in delivery schedules, has become a major competitive strategy and a competitive advantage to the firms. This is sometimes called as agile manufacturing.
5. **Time Reduction:** Reduction of manufacturing cycle time and speed to market for a new product provide competitive edge to a firm over other firms. When companies can provide products at the same price and quality, quicker delivery (short lead times) provide one firm competitive edge over the other.
6. **Technology:** Advances in technology have led to a vast array of new products, new processes and new materials and components. Automation, computerisation, information and communication technologies have revolutionised the way companies operate. Technological changes in products and processes can have great impact on competitiveness and quality, if the advanced technology is carefully integrated into the existing system.
7. **Worker Involvement:** The recent trend is to assign responsibility for decision making and problem solving to the lower levels in the organisation. This is known as employee involvement and empowerment. Examples of worker involvement are quality circles and use of work teams or quality improvement teams.
8. **Re-engineering:** This involves drastic measures or break-through improvements to improve the performance of a firm. It involves the concept of clean-slate approach or starting from scratch in redesigning the business processes.
9. **Environmental Issues:** Today's production managers are concerned more and more with pollution control and waste disposal which are key issues in protection of environment and social responsibility. There is increasing emphasis on reducing waste, recycling waste, using less-toxic chemicals and using biodegradable materials for packaging.
10. **Corporate Downsizing (or Right Sizing):** Downsizing or right sizing has been forced on firms to shed their obesity. This has become necessary due to competition, lowering productivity, need for improved profit and for higher dividend payment to shareholders.
11. **Supply-Chain Management:** Management of supply-chain, from suppliers to final customers reduces the cost of transportation, warehousing and distribution throughout the supply chain.

12. **Lean Production:** Production systems have become lean production systems which use minimal amounts of resources to produce a high volume of high-quality goods with some variety. These systems use flexible manufacturing systems and multi-skilled workforce to have advantages of both mass production and job production (or craft production).

(b) **Percentage of working time =** ((3000-500)/3000) × 100 = 83.33%
Actual working time in a study of 150 hrs = 150 × 0.8333 × 60 = 7500 min.
Production = 7000 units.
Time required for one unite to produce = 7500/7000 = 1.0714 min
So, manual time on this is 1.0714 × (3/5) = 0.643 mins and machine time is 1.0714 × (2/5) = 0.43 mins**.**
Normal time of labour = time of labour as per study× Rating Factor/100= 0.643×120/100= 0.772 min.
And normal time of machine = 0.43 min**.**
Now, if allowance is considered which is 11% of normal time which bring the standard time for the labour to produce = 0.772 × 1.11 = 0.857 min**.**
Hence Standard time required to produce a product = 0.857 + 0.43 = 1.286 min.
And. Standard time required to produce 49000 units = 49000 × 1.286 = 63,038 min = 1050 hrs.
Now, total available working hrs for 24 working day of 8 hrs shift of 7 labours = 1344 hr in a month
Taking absenteeism in consideration actual working hour left = 1344 × 0.94 = 1263.4 hrs.
Efficiency of utilisation of Labour= 1050/1344 = 0.7813 (78.13%)
And, Productive efficiency of Labour = 1050/1263.4 = 0.8312 (83.12%)

3. (a) The management of HOTEL KOLKATA INTERNATIONAL is considering the period of replacement of light bulbs fitted in its rooms. There are 500 rooms in the hotel and each room has 6 bulbs. The management is now following the policy of replacing the bulbs as they fail at a total cost of ₹30 per bulb. The management feels that this cost can be reduced to ₹10 per bulb by adopting the periodic replacement policy. On the basis of the information given below, evaluate the alternative and make a recommendation to the management: [7]

Months of use	1	2	3	4	5
Percent of bulb failing by that month	10	25	50	80	100

(b) M/s. Tubes Ltd. are the manufacturers of picture tubes of T.V. The following are the details of their operation during 2025:

Average monthly market demand	**2,000 tubes**
Ordering cost	**₹100 per order**
Inventory carrying cost	**20% per annum**
Cost of tubes	**₹500 per tube**
Normal usage	**100 tubes per week**
Minimum usage	**50 tubes per week**
Maximum usage	**200 tubes per week**
Lead time to supply	**6 – 8 weeks**

Calculate the following:

(1) Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting?

(2) Maximum level of stock.

(3) Minimum level of stock.

(4) Re-order level of stock. **[7]**

Answer:

(a) For solving this problem, the following assumptions are made:

- Bulbs that fail during a month are replaced just before the end of that month,
- The actual percentage of failures during a month as for a subpopulation of bulbs with the same age is the same as the expected percentage of failures during the month of that subpopulation.

The probability of failures can be arranged as follow:

Months of use	1	2	3	4	5
Percent of bulb failing by that month	10	15	25	30	20

Let, N_0 represents the number of original bulbs and F_i denotes the number of bulbs failed and replaced at the end of the i-th month. i = 1,2,3,4,5

$N_0 = 500 \times 6 = 3,000$

$F_1 = N_0P_1 = 3,000 \times 0.1 = 300.$

$F_2 = N_0P_2 + F_1P_1 = 3,000 \times 0.15 + 300 \times 0.10 = 480.$

$F_3 = N_0P_3 + F_1P_2 + F_2P_1 = 3,000 \times 0.25 + 300 \times 0.15 + 480 \times 0.10 = 843.$

$F_4 = N_0P_4 + F_1P_3 + F_2P_2 + F_3P_1 = 3,000 \times 0.30 + 300 \times 0.25 + 480 \times 0.15 + 843 \times 0.10 = 1,131.$

$F_5 = N_0P_5 + F_1P_4 + F_2P_3 + F_3P_2 + F_4P_1 = 3,000 \times 0.20 + 300 \times 0.30 + 480 \times 0.25 + 843 \times 0.15 + 1,131 \times 0.10 = 1,049.$

Note: F_2: 15% of the original set of 3,000 bulbs and 10% of the bulbs replaced at the end of 1st month as at the end of second month, these are one month old.

F_3: 25% of the original set of 3,000 bulbs, 10% of the bulbs replaced at the end of 2nd month as these are one month old and 15% of the bulbs replaced at the end of 1st month as these are 2 months old.

And so on.

Group Replacement policy:

End of month	No. of bulbs failed	Cumulative no. of bulbs failed	Cost of replacement @ ₹ 30 per bulb	Total cost	Average cost per month
1	300	300	9000	39000	39000
2	480	780	23400	53400	26700
3	843	1623	48690	78690	26230
4	1131	2754	82620	112620	28155
5	1049	3803	114090	144090	28818

The minimum average cost per under group replacement is ₹26,230 at the end of 3rd month.

Individual Replacement policy:

Expected life of each bulb = 1 × 0.10 + 2 × 0.15 + 3 × 0.25 + 4 × 0.30 + 5 × 0.20 = 3.35 months.

Average no. of failure and replacement per month = 3,000 ÷ 3.35 = 896.

Average cost of individual replacement = 896 × ₹30 = ₹26,880.

Comment: The average cost of group replacement is lower than individual replacement. Hence, it is cheaper to have a group replacement after every 3rd month and individually any that fails before that.

(b) (i) Economic Order Quantity:

Annual usage of tubes (A) =Normal usage per week×52 weeks = 100 tubes×52 weeks =5,200 tubes.

Ordering cost per order (S) = ₹100.

Inventory carrying cost per unit per annum (C) = 20% of ₹500 = ₹100

EOQ = $\sqrt{2AS}/C$ = $\sqrt{\mathbf{2} \times \mathbf{5{,}200}\ \boldsymbol{units} \times \mathbf{100}}\ /\mathbf{100}$ = 102 units (approx.).

Evaluation of order size of 1,500 units at 5% discount

No. of orders = 5,200 units/1,500 units = 3.46 or 4 (in case of a fraction, the next whole number is considered). Ordering cost (No. of order per year at ₹100 per order)	₹400
Carrying cost of average inventory: = $\mathbf{1{,}500}\ \boldsymbol{units}/\mathbf{2} \times ₹\ (\mathbf{500}\ \boldsymbol{less}\ \mathbf{5}\%) \times \mathbf{20}\ /\mathbf{100}$	₹71,250
Total annual cost (excluding item cost)	₹71,650

(ii) Maximum Level of Stock:

= Re-order level + Re-order quantity – (Minimum usage × Minimum delivery period)

= 1,600 units + 102 units – (50 units × 6 weeks)

= 1,402 units.

[Assume that the Reorder quantity is supplied as soon as the Reorder level is reached]

(iii) Minimum Level of Stock: = Re-order level – (Normal usage × Normal delivery period)

= 1,600 units – (100 units × 7 weeks)

= 900 units.

[Note: Normal delivery period is taken to be the average delivery period.]

(iv) Re-order Level of Stock: = Maximum usage × Maximum delivery period

= 200 units × 8 weeks

= 1,600 units

4. (a) Four jobs can be processed on four different machines, with one job on one machine. Resulting profits vary with assignments. They are given below:

Jobs/ Machines	A	B	C	D
(i)	42	35	28	21
(ii)	30	25	20	15
(iii)	30	25	20	15
(iv)	24	20	16	12

Calculate the optimum assignment of jobs to machines and the corresponding profit. **[7]**

(b) The processing times (t_j) in hrs for the five jobs of a single machine scheduling is given. Find the optimal sequence which will minimise the mean flow time and find the mean flow time.
Prepare a sequence which will minimise the weighted mean flow time and find the mean flow time.
[7]

Job (j)	**1**	**2**	**3**	**4**	**5**
Processing time (t_j) hrs	**30**	**8**	**10**	**28**	**16**
Weight (W_j)	**1**	**2**	**1**	**2**	**3**

Answer:

(a) As this is a problem of Maximisation, the same is converted to one of Minimisation by firming a Relative Loss Matrix where all the elements of the given matrix are subtracted from the highest element of the matrix (which is 42 in this case)

Relative Loss Matrix

Jobs /Machines	**A**	**B**	**C**	**D**
(i)	0	7	14	21
(ii)	12	17	22	27
(iii)	12	17	22	27
(iv)	18	22	26	30

Matrix after Row Operation

Jobs/ Machines	**A**	**B**	**C**	**D**
(i)	0	7	14	21
(ii)	0	5	10	15
(iii)	0	5	10	15
(iv)	0	4	8	12

Matrix after Column Operation

Jobs/ Machines	**A**	**B**	**C**	**D**
(i)	0	3	6	9
(ii)	0	1	2	3
(iii)	0	1	2	3
(iv)	~~0~~	~~0~~	~~0~~	~~0~~

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 2 ≠ Order of the matrix (4). So the solution is non optimal.

Improved Matrix (Non Optimal)

Jobs/ Machines	A	B	C	D
(i)	0	2	5	8
(ii)	0	0	1	2
(iii)	0	0	1	2
(iv)	1	0	0	0

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 3 ≠ Order of the matrix (4). So the solution is non optimal.

Further Improved Matrix [Optimal Solution (i)]

Jobs/ Machines	A	B	C	D
(i)	[0]	2	4	7
(ii)	0	[0]	0	1
(iii)	0	0	[0]	1
(iv)	2	1	0	[0]

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 4 = Order of the matrix. So, the solution is optimal.

Further Improved Matrix (Optimal Solution-ii)

Jobs/ Machines	A	B	C	D
(i)	[0]	2	4	7
(ii)	0	0	[0]	1
(iii)	0	[0]	0	1
(iv)	2	1	0	[0]

Assignment as per Solution (i)			Assignment as per Solution (ii)		
Jobs	**M/cs**	**Profit (₹)**	**Jobs**	**M/cs**	**Profit (₹)**
(i)	A	42	(i)	A	42
(ii)	B	25	(ii)	C	20
(iii)	C	20	(iii)	B	25
(iv)	D	12	(iv)	D	12
Total	-	**₹99**	Total	-	**₹99**

Maximum Profit=₹99

Answer:

(b) (i) First arrange the jobs as per the shortest processing time (SPT) sequence.

Job (j)	**2**	**3**	**5**	**4**	**1**
Processing time (t_j) hrs	8	10	16	28	30

Therefore, the job sequence that minimises the mean flow time is: **2 – 3 – 5 – 4 – 1**

Computation of minimum flow time (F)

The flow time is the amount of time the job 'j' spends in the system. It is a measure which indicates the waiting of jobs in the system. It is the difference between the completion time (C_j) and ready time (R_j) for job j.

$F_j = C_j - R_j$

Job (j)	**2**	**3**	**5**	**4**	**1**
Processing time (tj) hrs	8	10	16	28	30
Completion time (C_j)	8	18	34	62	92

Since the ready time (Rj) = 0 for all j, the flow time (F_j) is equal to C_j for all j.

$$\textbf{Mean flow time} = \bar{F} = \frac{1}{n}\sum_{j=1}^{n} F_j = \frac{1}{5}[8 + 18 + 34 + 62 + 92] = \frac{1}{5}[214] = 42.8$$

(ii) The weights are given as follows:

Job (j)	**1**	**2**	**3**	**4**	**5**
Processing time (t_j) hrs	30	8	10	28	16
Weight (W_j)	1	2	1	2	3

The weighted processing time =**processing time (t_j) / weight (W_j)**

The weighted processing time is represented as:

Job (j)	**1**	**2**	**3**	**4**	**5**
Processing time (t_j) hrs	30	8	10	28	16
Weight (W_j)	1	2	1	2	3
Weighted Processing time (t_j / W_j)	30	4	10	14	5.31

Thus, arranging the jobs in the increasing order of tj/W_j (weighted shortest processing time WSPT), we have

Job (j)	2	5	3	4	1
Weighted Processing line(t_i / W_i)	4	5.31	10	14	30

The optimal sequence that minimises the weighted mean flow time is 2-5-3-4-1.

Weighted Mean flow time ($\bar{F}_{px}$):

Weighted Mean flow time = ($\bar{F}_w$): $\bar{F}_w = \frac{\sum_{j=1}^{n} W_j F_j}{\sum_{j=1}^{n} W j}$

Job (j)	2	5	3	4	1
Processing time (t_j) hrs	8	16	10	28	30
$F_j = (C_j - R_j)$	8	24	34	62	92
W_j	2	3	1	2	1
$F_j \times W_j$	16	72	34	124	92

The weighted mean flow time is computed as follows for optimal sequence.

Weighted mean flow time (F_w)is computed as

$$\bar{F}_w = \frac{(16 + 72 + 34 + 124 + 92)}{(2 + 3 + 1 + 2 + 1)} = 37.55\ Hrs.$$

5. (a) A Bank is in the process of formulating its loan policy. Involving a maximum of ₹600 million. Table below gives the relevant types of loans. Bad debts are not recoverable and produce no interest receive. To meet competition from other Banks the following policy guidelines have been set. At least 40% of the funds must be allocated to the agricultural and commercial loans. Funds allocated to housing must be at least 50% of all loans given to personal, car, Housing. The overall bad debts on all loans may not exceed 0.06.

Formulate a linear program Model to determine optimal loan allocations.

Type of loan	Interest rate %	Bad debts (Probability)
Personal	17	0.10
Car	14	0.07
Housing	11	0.05
Agricultural	10	0.08
Commercial	13	0.06

(b) For the given data find the expected duration of the project and variance of the project [7]

Activity	Optimistic time (t_o)	Most likely Time (t_m)	Pessimistic time (t_p)
1-2	6	9	12
1-5	4	7	8
2-3	14	17	20
2-4	7	10	13
2-5	3	5	9
3-7	13	18	25
4-6	10	14	16
4-7	12	15	18
5-6	9	11	12
6-7	17	20	25

Answer:

(a) Let x_1 be the amount allocated for personal loan
Let x_2 be the amount allocated for car loan
Let x_3 be the amount allocated for Housing loan
Let x_4 be the amount allocated for agricultural loan
Let x_5 be the amount allocated for Commercial loan

Objective Function: Max Z

$= 0.17x_1 + 0.14\ x_2 + 0.11\ x_3 + 0.1\ x_4 + 0.13\ x_5 - (0.10\ x_1 + 0.07\ x_2 + 0.05\ x_3 + 0.08\ x_4 + 0.06\ x_5)$

$= (0.17 - 0.10)\ x_1 + (0.14 - 0.07)\ x_2 + (0.11 - 0.05)\ x_3 + (0.10 - 0.08)\ x_4 + (0.13 - 0.06)\ x_5$

$= 0.07\ x_1 + 0.07\ x_2 + 0.06\ x_3 + 0.02\ x_4 + 0.07\ x_5$

Subject to constraints

(i) $x_1 + x_2 + x_3 + x_4 + x_5 \leq 600$ Millions (Constraint on total loan amount)

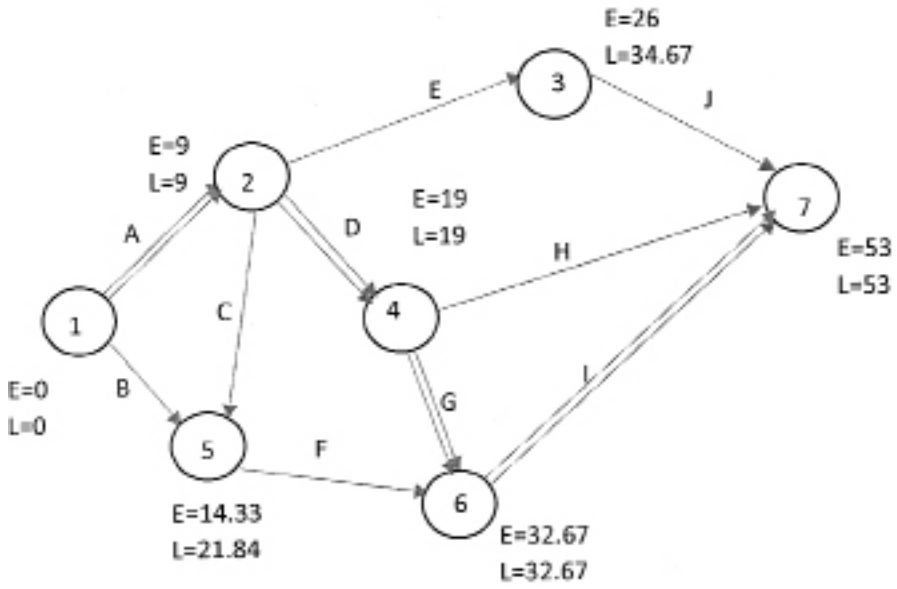
(ii) $x_4 + x_5 \geq 0.4\ (x_1 + x_2 + x_3 + x_4 + x_5)$ (Constraint due to policy set for Agricultural and Commercial Loan)

(iii) $x_3 \geq 0.5\ (x_1 + x_2 + x_3)$ (Constraint due to policy set for Housing Loan)

(iv) $0.1\ x_1 + 0.07\ x_2 + 0.05\ x_3 + 0.08\ x_4 + 0.06 \times x_5 \leq 0.06$ Million (Constraint on limit of overall bad debt)

(v) $x_1, x_2, x_3, x_4, x_5 \geq 0$ (Non negativity constraint)

(b)



Activity	Optimistic time (t_o)	Most likely Time (t_m)	Pessimistic time (t_p)	$a^2=(t_p-t_o/6)^2$	$t_e=t_o+4t_m+t_p$ /6
1-2	6	9	12	1.00	9.0
1-5	4	7	8	0.44	6.7
2-3	14	17	20	1	17.0
2-4	7	10	13	1	10.0
2-5	3	5	9	1	5.33
3-7	13	18	25	4	18.33
4-6	10	14	16	1	13.67
4-7	12	15	18	1	15.00
5-6	9	11	12	0.25	10.83
6-7	17	20	25	1.78	20.33

The critical path is 1 - 2 - 4 - 6 - 7

Variance of the critical path = 1 + 1 + 1.78 = 3.78

SD of the critical path = SD of the network diagram = $\sqrt{(3.78)} = 1.944$

6. (a) Discuss about EVA-driven responsibility accounting. **[7]**

(b) State the characteristics and the benefits of Big Data. **[7]**

Answer:

(a) Profit is the surplus of revenues over costs available for distribution to the owners of the firm.

The transition from accounting profit to economic profit was triggered due to a major problem of accounting profit as it combines two types of returns: the normal return to capital that rewards investors for the use of their capital; and economic profit, which is the pure surplus available after all inputs (including capital) have been paid for. Economic profit represents a purer and more reliable measure of profit that is a better measure of performance. In order to distinguish economic profit from accounting profit, economic profit is often referred to as rent or economic rent.

A widely used measure of economic profit is economic value added (EVA), devised and popularised by the New York consulting firm Stern Stewart & Company.

EVA = Net Operating Profit After Tax (NOPAT) - Cost of Capital

Cost of capital is calculated as: capital employed multiplied by the weighted average of capital (WACC). Economic profit has two main advantages over accounting profit as a performance measure.

First, it sets a more demanding performance discipline for managers. As Stern Stewart's calculations show,
many major corporations' apparent profitability disappears once cost of capital is taken into account.

Second, using economic profit improves the allocation of capital between the different businesses of the firm by taking account of the real costs of more capital intensive businesses.

(b) Characteristics of Big Data:

- **Volume –** Size of data plays a very crucial role in determining value out of data. Also, whether a particular data can actually be considered as a Big Data or not, is dependent upon the volume of data. The name Big Data itself is related to a size which is enormous. Hence, 'Volume' is one characteristic which needs to be considered while dealing with Big Data solutions.
- **Variety –** Variety refers to heterogeneous sources and the nature of data, both structured, unstructured and semi structured. During earlier days, spreadsheets and databases were the only sources of data considered by most of the applications however, in recent period data can be in the form of emails, photos, videos, monitoring devices, PDFs, audio, etc. These data also need to be analysed.
- **Velocity –** The term 'velocity' refers to the speed of generation of data and processing of data to be responsive to the needs of the customers. Big Data velocity deals with the speed at which data flows in from sources like business processes, application logs, networks, and social media sites, sensors, mobile devices, etc. The flow of data is massive and continuous.
- **Variability –** This refers to the inconsistency which can be shown by the data at times, thus hampering the process of being able to handle and manage the data effectively.

The following are some of the benefits of Big Data Processing

1. Businesses can utilize outside intelligence while taking decisions.
2. Improved customer service.
3. Early identification of risk to the product/services, if any.
4. Better operational efficiency.

7. (a) Discuss the concept of PESTEL Framework. **[7]**

(b) Critically discuss BCG Matrix. **[7]**

Answer:

(a) **Political** processes shape a society's laws, which constrain the operations of organisations and managers and thus create both opportunities and threats. Political instability creates adverse conditions for the businesses to function. Investors rarely want to invest in countries where there is political turmoil and this in turn can be detrimental to the businesses in those regions. On the other hand, political stability and favourable government attitude towards businesses can create a lot of opportunities and is considered to be a favourable business environment.

Macroeconomic forces affect the general health and well-being of a nation or the regional economy of an organisation which in turn affect companies' and industries' ability to earn an adequate rate of return.

The four most important macroeconomic forces are the growth rate of the economy, interest rates, currency exchange rates, and inflation (or deflation) rates.

- Economic growth tends to ease competitive pressures within an industry as it leads to an expansion in customer expenditures. This gives companies the opportunity to expand their operations and earn higher profits. On the other hand, economic decline (a recession) increases competitive pressures as leads to a reduction in customer expenditures.

- Interest rates can determine the demand for a company's products. Interest rates are important whenever customers routinely borrow money to finance their purchase of these products. Interest rates are also important because they influence a company's cost of capital, and therefore its ability to raise funds and invest in new assets. The lower the interest rates the lower the cost of capital for companies and more opportunities for investment.

- Currency exchange rates define the comparative value of different national currencies. Movement in currency exchange rates has a direct impact on the competitiveness of a company's product.

- Price inflation can destabilise the economy, producing slower economic growth, higher interest rates, and volatile currency movements. If inflation continues to increase, investment planning will become hazardous. The key characteristic of inflation is that it makes the future less predictable. Price deflation also has a destabilizing effect on economic activity. If prices fall, the real price of fixed payments goes up. This is damaging for companies and individuals with a high level of debt who must make regular fixed payments on that debt.

Social influences include changing cultures and demographics. Demographic forces are outcomes of changes in the characteristics of a population, such as age, gender, ethnic origin, race, sexual orientation, and social class. Like the other forces in the general environment, demographic forces present managers with opportunities and threats and can have major implications for organisations.

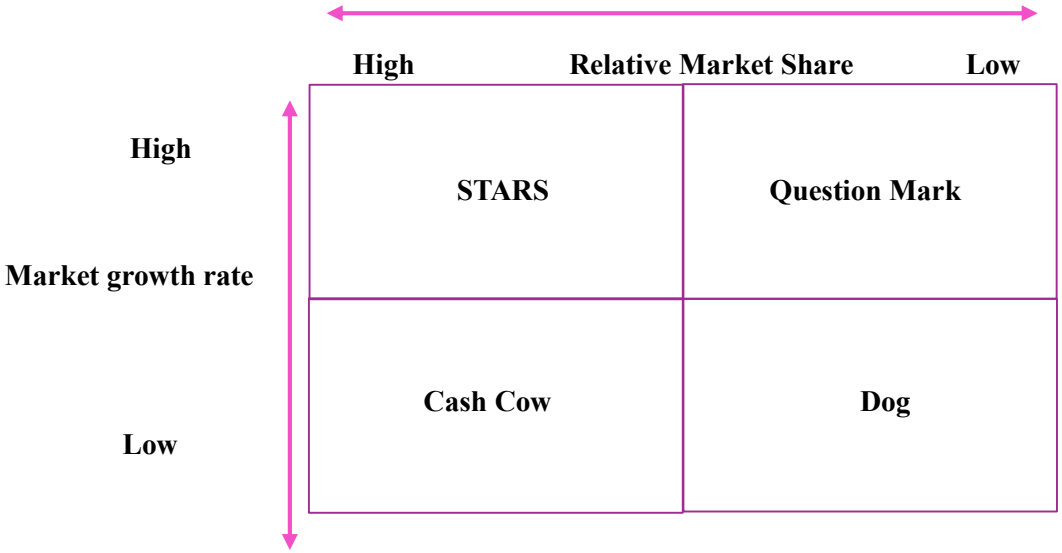
Technological influences refer to innovations such as artificial intelligence, internet, nano-technology, or the rise of new composite materials.

Environmental stands specifically for 'green' issues, such as pollution and waste. The environmental factors have now become extremely important for organisations as countries across the globe are increasingly concerned with the environmental changes and are striving towards clean, green and renewable sources of energy. The disposal of e –waste and global warming are also very important causes of concern. Organisations need to be more environment friendly.

Finally, **legal** embraces legislative constraints or changes, such as health and safety legislation or restrictions on company mergers and acquisitions

(b) The growth/share (or BCG) matrix

One of the most common and long-standing ways of conceiving of the balance of a portfolio of businesses is the Boston Consulting Group (BCG) matrix.



Here market share and market growth are critical variables for determining attractiveness and balance. High market share and high growth are, of course, attractive. However, the BCG matrix also warns that high growth demands heavy investment, for instance to expand capacity or develop brands. There needs to be a balance within the portfolio, so that there are some low growth businesses that are making sufficient surplus to fund the investment needs of higher growth businesses. The market growth/market share axes of the BCG matrix define four sorts of business:

- A **star** is a business unit which has a high market share in a growing market. The business unit may be spending heavily to keep up with growth, but high market share should yield sufficient profits to make it more or less self-sufficient in terms of investment needs.
- A **question mark** (or problem child) is a business unit in a growing market, but not yet with high market share. Developing question marks into stars, with high market share, takes heavy investment. Many question marks fail to develop, so the BCG advises corporate parents to nurture several at a time. It is important to make sure that some question marks develop into stars, as existing stars eventually become cash cows and cash cows may decline into dogs.
- A **cash cow** is a business unit with a high market share in a mature market. However, because growth is low, investment needs are less, while high market share means that the business unit should be profitable. The cash cow should then be a cash provider, helping to fund investments in question marks.
- **Dogs** are business units with a low share in static or declining markets and are thus the worst of all combinations. usually recommends divestment or closure.

The BCG matrix has several advantages.

It provides a good way of visualising the different needs and potential of all the diverse businesses within the corporate portfolio.

It warns corporate parents of the financial demands of what might otherwise look like a desirable portfolio of high-growth businesses.

It also reminds corporate parents that stars are likely eventually to wane.

Finally, it provides a useful discipline to business unit managers, underlining the fact that the corporate parent ultimately owns the surplus resources they generate and can allocate them according to what is best for the corporate whole. Cash cows should not hoard their profits. Incidentally, surplus resources may not only be investment funds: the corporate parent can also reallocate business unit managers who are not fully utilised by low-growth cash cows or dogs. However, there are at least three potential problems with the BCG matrix:

Definitional vagueness: It can be hard to decide what high and low growth or share mean in particular situations. Managers are often keen to define themselves as 'high share' by defining their market in a particularly narrow way (for example, ignoring relevant international markets)

Capital market assumptions:

- The notion that a corporate parent needs a balanced portfolio to finance investment from internal sources (cash cows) assumes that capital cannot be raised in external markets, for instance by issuing shares or raising loans.
- The notion of a balanced portfolio may be more relevant in countries where capital markets are underdeveloped or in private companies that wish to minimise dependence on external shareholders or banks. Unkind to animals:
- Both cash cows and dogs receive ungenerous treatment, the first being simply milked, the second terminated or cast out of the corporate home. This treatment can cause motivation problems, as managers in these units see little point in working hard for the sake of other businesses.
- There is also the danger of the self-fulfilling prophecy. Cash cows will become dogs even more quickly than the model expects if they are simply milked and denied adequate investment.
- Finally, the notion that a dog can be simply sold or closed also assumes that there are no ties to other business units in the portfolio, whose performance might depend in part on keeping the dog alive. This portfolio approach to dogs works better for conglomerate strategies, where divestments or closures are unlikely to have knock-on effects on other parts of the portfolio.

8. (a) "While designing a Control System, top management should remember that controls should follow strategy". In this context enumerate the recommended guidelines for proper control. [7]

(b) Demonstrate in brief some of the areas that have the ability to create goal congruence. [7]

Answer:

(a) The following guidelines are recommended for proper Control.

(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 goal displacement. Managers will fudge reports and lobby for lower standards.

(b) Some of the areas that have the ability to create Goal Congruence are stated below:

(i) Communication and Understanding – Channels of communication and how goals are perceived are important to achieve goal congruence. Operational managers have a responsibility of being aware as to what actions are desirable and what goals are to be achieved. It should be understood that the communication of different goals can occur through informal channels, which involves meetings and face to face interactions, or through formal channels including budgets or other financial documents.

(ii) Create direction – One of the reasons for lack of goal congruence is the absence of direction related to employees' behaviour. Performance management and goals facilitate efficient communication about what managers want their subordinates to focus on. It needs no mention that providing clear information and direction, employees can better understand what is expected from them, how to perform adequately, and how to contribute effectively to the achievement of the organisational goal.

(iii) Motivation – The problem of motivation can exist even though employees have knowledge about how to perform adequately because employees can act in their own self-interest instead of in the 10 organisation's best interest. The employees can make their own performance report better by allocating resources without befitting the organisation as a whole. One of the strongest reasons for demotivation among employees and managers is dislike for the work allocated. The reason for motivation varies among employees. While some employees feel motivated for some recognition and appraisals others may feel motivated because of commitment and responsibility without any required pay off. The more motivated the employees of the organisation the better will be the goal congruence.

(iv) Incentives – In order to increase the likelihood of employees working to achieve their individual goals, organisation's aim to influence motivation by providing incentives. Research suggests that individuals tend to perform better when they are rewarded. Rewards and compensations should

create goal congruence between individual goals and organisational goals by stimulating individuals to perform by providing incentives, as rewards are related to increased effort.

(v) **Connection–** It is very important to create a connection between goals, performance measures and incentives. In order to align the employees' self-interest and overall organisational objectives it is necessary to relate incentives with performance**.**