

**Economics/Management/Entrepreneurship**  
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PROBLEMS

**Question 2 – 5.1**

In economics, what is meant by “market” and “market equilibrium?”

**Answer**

Market is a kind of arrangement whereby buyers and sellers *interact to exchange* goods, services, stocks, contracts, and so on.

Market Equilibrium is perfect balance in demand and supply under a given set of market conditions

**Question 2 – 5.2**

Fill in the missing data for price (P), total revenue (TR), marginal revenue (MR), total cost (TC), marginal cost (MC), and profit (p) in the following table:

Q	P (Rs)	TR (Rs)	MR (Rs)	TC (Rs)	MC (Rs)	AC (Rs)	p (Rs)
0	75	0	-	25		-	25
1	70	70	70	44	19	44	26
2	68		66	68		34	
3		198		93			105
4			54	106	40		150
5	62					32	

**Answer**

Q	P (Rs)	TR (Rs)	MR (Rs)	TC (Rs)	MC (Rs)	AC (Rs)	p (Rs)
0	75	0	-	25		-	25
1	70	70	70	44	19	44	26
2	68	136*	66	68	24 <sup>+</sup>	34 <sup>#</sup>	68 <sup>@</sup>
3	66 <sup>”</sup>	198	62 <sup>o</sup>	93	25	31	105
4	64	256	54	106	40	26.5	150
5	62	310	54	160	54	32	150

\*136 = (68)(2); <sup>+</sup>24 = 68 – 44; <sup>#</sup>34 = 68/2; <sup>@</sup>68 = (34)(2) <sup>”</sup>66 = 198/3; <sup>o</sup>62 = 198 – 136

**Question 2 – 5.3**

Gopal Sports is an export sport vehicle manufacturing company. Demand and supply functions for the vehicle are as follows:

$$Q_D = 75,000 - 4P \quad (\text{Demand})$$

$$Q_s = 6P \quad (\text{Supply})$$

Calculate the market equilibrium price/output combination.

**Answer**

$$Q_D = 75,000 - 4P$$

$$Q_s = 6P$$

At the equilibrium,  $Q_D = Q_s$ .

Solving,  $P = \text{Rs. } 7,500.00$

Equilibrium Demand =  $75,000 - (4)(7,500) = 45,000$  Rs.

Equilibrium Supply =  $(6)(7,500) = 45,000$  Rs.

**Question 2 – 5.4**

Sharma Sports produces football footwear. It gave a Rs 50 discount on the Rs 500 price of a football footwear, and the sales rose from 9,000 to 10,000 units in the month of August. Calculate the price elasticity for the football footwear.

**Answer**

$$\text{Price elasticity} = (\Delta Q / \Delta P) / (Q / P) = [(10,000 - 9,000) / (450 - 500)] / (9,000 / 500) = -1.11$$

**Question 2 – 5.5**

What is cross elasticity of demand? In which conditions can this elasticity become positive or negative?

**Answer**

Cross elasticity of demand measures the change in demand of a good with respect to the change in price of another good.

Cross elasticity is positive in case of a substitute and is negative in case of a complement.

**Question 2 – 5.6**

What is forecasting? Indicate four areas of application where forecasting is useful.

**Answer**

Forecasting is an estimate of the value of a variable in the future. It is an input to planning. Planning for production, capacity, inventory, and cash requires forecasting.

**Question 2 – 5.7**

What is a production function? Determine the nature of returns to scale when the production function has the following shape?

$$Q = 20 L^{0.25} K^{0.70}$$

### Answer

Production function is the maximum possible output that can be produced using a given combination of inputs.

$$\text{Given } Q = 20 L^{0.25} K^{0.70}$$

When the inputs are changed to  $c$  times their original values, the output is given by

$$Q1 = 20 (cL)^{0.25} (cK)^{0.70} = c^{0.925} (20L^{0.25} cK^{0.70}) = c^{0.925} Q$$

$c^{0.925} < c$ ; hence the production function exhibits diminishing returns to scale.

### Question 7.1

Define the following terms:

- Cost driver
- Fixed cost
- Variable cost
- Contribution margin
- Break-even point

### Answer

*Cost driver* is any output measure that causes costs (i.e., that causes the use of a costly resource).

*Fixed cost* is that which is not immediately affected by changes in the cost driver level.

*Variable cost* is that which changes in direct proportion to changes in the cost driver level.

*Contribution margin* is sales price minus the unit variable cost.

*Break-even point* is the level of output at which revenue equals expenses and the net income is zero.

### Question 7.2

The following list gives several potential cost drivers for a manufacturing company that makes several products that vary in size from small to large:

- Number of setups
- Cubic meters
- Cubic meters per week
- Setup time
- Square meters

For each of the following situation, pick up the best cost driver:

- a. Operators set up the machines for the products. Setup times are almost the same irrespective of the sizes of the products. What is the cost driver for the operator wage?
- b. Operators set up the machines for the products. Setup times differ from product to product. What is the cost driver for the operator wage?

- c. What driver should be used for warehouse occupancy costs (depreciation and insurance) if the warehouse is used to store finished products for a small period of time?
- d. What driver should be used for warehouse occupancy costs (depreciation and insurance) if the warehouse is used to store finished products for a long period of time?

**Answer**

- a. Number of setups
- b. Setup time
- c. Cubic meters
- d. Cubic meters per week

**Question 7.3**

Fill in the blanks for each of the following cases:

Case	Selling price per unit	Variable cost per unit	Total units sold	Total contribution margin	Total fixed costs	Net income
1.	Rs.25	_____	120,000	720,000	640,000	_____
2.	10	6	100,000	_____	320,000	_____
3.	20	15	_____	100,000	_____	15,000

**Answer**

Case	Selling price per unit	Variable cost per unit	Total units sold	Total contribution margin	Total fixed costs	Net income
1.	Rs.25	19	120,000	720,000	640,000	80,000
2.	10	6	100,000	400,000	320,000	80,000
3.	20	15	20,000	100,000	85,000	15,000

**Question 7.4**

Janapur Fashion sells both designer and moderately priced women’s wear. Profits have been volatile. Top management is trying to decide which product line to drop. Accountants have reported the following data:

	Per Item	
	Designer	Moderately Priced
Average selling price	Rs. 240	Rs. 140
Average variable expenses	<u>120</u>	75
Average contribution margin	<u>120</u>	<u>65</u>
Average contribution-margin (%)	<u>50%</u>	<u>46%</u>

The store has 8,000 square feet of floor space. If moderately priced goods are sold exclusively, 400 items can be displayed. If designer goods are sold exclusively, only 300 items can be displayed. Moreover, the rate of sale (turnover) of the designer items will be two-thirds the rate of moderately priced goods.

- a. Prepare an analysis to show which product to drop.
- b. What other considerations might affect your decision to requirement a?

### Answer

Assuming only moderately priced goods will be stored and sold and assuming that all the goods are sold out, the contribution to profit

$$= (65)(400) = 26,000 \text{ Rs.}$$

If only designer goods are stored and sold out, the number of designer goods that will be sold

$$= (2/3)(400) = 266 \text{ units}$$

The contribution to profit

$$= (120)(266) = 31,920 \text{ Rs.}$$

Hence the designer goods should be stored and the moderately priced goods are to be dropped.

Other considerations:

Both the goods can be stored.

Let

$X_1$  be the number of moderately priced goods stored

$X_2$  be the number of designer goods stored

The area occupied by these items should be less than the available area:

$$(8,000/400)X_1 + (8,000/300)X_2 \leq 8,000$$

Also the equality sales constraints hold:

$$X_2 = (2/3)X_1$$

The store should maximize the total contribution to profit:

$$65 X_1 + 120 X_2$$

Solving one gets the optimum values of the number of moderately priced and designer goods as

$$X_1 = 3,600/17 \text{ units and } X_2 = 2,400/17 \text{ units}$$

That means the store should store both the goods of quantities mentioned above.

### Question 7.5

The manager of operations of Blue Sky Airlines is trying to decide whether to adopt a new discount fare. Focus on one 134-seat 737 airplane now operating at a 56% load factor (i.e, on the average the airplane has  $0.56 \times 134 = 75$  passengers). The regular fares produce an average revenue of Rs.1.20 per passenger kilometer.

Suppose an average of 40% fare discount (which is subject to restrictions regarding time of departure and length of stay) will produce three new additional passengers. Also suppose that three of the previously committed passengers accept the restrictions and switch to the discount fare from the regular fare.

- Compute the total revenue per airplane kilometer with and without the discount fares.
- Suppose the maximum allowed allocation to new discount fares is 50 seats. These will be filled. As before some previously committed passengers will accept the restrictions and switch to the discount fare from the regular fare. How many will have to switch so that the total revenue per kilometer will be the same either with or without the discount plan?

### Answer

Regular fare = 1.20 Rs/km/person, Number of passengers = 75 persons

*Total revenue without discount (i.e. regular) fare* =  $(75)(1.20) = 90.00$  Rs

Discount fare =  $(1 - 0.4)(1.20) = 0.72$  Rs/km

Number of passengers with regular fare =  $75 - 3 = 72$  person

Number of passengers with discount fare =  $3 + 3 = 6$  person

*Total revenue with discount fare* =  $(72)(1.20) + (6)(0.72) = 90.72$  Rs/km

Suppose X number of regular-fare passengers shift to discount-fare passengers, then the total revenue

$$= (75 - X)(1.20) + (50)(0.72) = 90 - 1.20X + 36 = 126 - 1.20X$$

If this amount equals the total revenue without discount fare, then

$$126 - 1.20X = 90$$

$$X = 30 \text{ persons.}$$

That means if 30 regular-fare passengers switch to discount fare, then the total revenue per kilometer does not change without or with discount.

### Question 8.1

Differentiate between

- Cost accumulation and Cost allocation
- Direct cost and Indirect cost

- c. Product cost and Period cost

**Answer**

- a. *Cost accumulation* is the activity of collecting costs by some natural classification such as materials, labour, or activities performed (such as order processing or machine operating), whereas *cost allocation* is the activity of tracing and reassigning costs to one or more cost objectives such as activities, departments, customers, or products.
- b. *Direct costs* are those that can be identified specifically and exclusively with a given cost objective in an economically feasible way, whereas *indirect costs* are those that cannot be identified specifically and exclusively with a given cost objective in an economically feasible way.

Thus wages of operators working on a product is a direct cost, whereas lubricants used for machining is an indirect cost.

- c. *Product costs* are those that are identified with goods produced or purchased for resale, whereas *period costs* are those that are deducted as expenses during the current period without going through an inventory stage.

Thus material cost is a product cost, whereas advertising cost is a period cost.

**Question 8.2**

Distinguish between costs and expenses.

**Answer**

*Cost* is a sacrifice or giving up of resources, often measured in monetary terms, for a given purpose, such as goods and services, whereas *expense* is that cost which is recognized and subtracted from revenue, while delivering goods or services or using up assets, to yield income.

Thus when 10,000 Rs worth of goods are purchased, it increases material cost by Rs. 10,000. But when 8,000 Rs worth of these goods are sold for Rs 12,000, then the expense incurred is taken as Rs. 8,000, yielding an income of Rs. 4,000.

**Question 8.3**

The cordless manufacturing division of a company uses activity based accounting. Its accountants have identified only the following three activities and related cost drivers for indirect manufacturing costs:

<u>Activity</u>	<u>Cost Driver</u>
Material activity	Direct-material cost
Engineering	Engineering change notices
Power	Kilowatt hours

Three types of cordless phones are produced: C1, C2, and C3. Direct costs and cost-driver activity for each product for a recent month are as follows:

	C1	C2	C3
Direct-materials cost (Rs)	25,000	50,000	125,000
Direct-labour cost (Rs)	4,000	1,000	3,000
Kilowatt hours (Rs)	50,000	200,000	150,000

Engineering change notices	13	5	2
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Indirect manufacturing cost for the month was

Material handling cost:	Rs. 8,000
Engineering:	Rs. 20,000
Power:	<u>Rs. 16,000</u>
Total indirect manufacturing cost:	<u>Rs. 44,000</u>

- Using activity-based costing system, compute the indirect manufacturing cost allocated to each product with the activity-based accounting system.
- Find also the cost of each type of cordless phones manufactured.
- If the number of cordless phones manufactured is 100, 200, and 500 respectively, find the unit costs of the phones.

### Answer

Cost drivers chosen for allocation of *indirect manufacturing costs* are the following:

Material handling cost:	Direct-material cost
Engineering:	Engineering change notices
Power:	Kilowatt hours

$$C1: (8,000)[25/(25 + 50 + 125)] + (20,000)[13/(13 + 5 + 2)] + (16,000)[50/(50 + 200 + 150)] \\ = 1,000 + 13,000 + 2,000 = 16,000$$

$$C2: (8,000)[50/(25 + 50 + 125)] + (20,000)[5/(13 + 5 + 2)] + (16,000)[200/(50 + 200 + 150)] \\ = 2,000 + 5,000 + 8,000 = 15,000$$

$$C3: (8,000)[125/(25 + 50 + 125)] + (20,000)[2/(13 + 5 + 2)] \\ + (16,000)[150/(50 + 200 + 150)] \\ = 5,000 + 2,000 + 6,000 = 13,000$$

Adding the direct costs, the costs of goods manufactured for the products are the following:

$$C1: 25,000 + 4,000 + 16,000 = 45,000 \text{ Rs.}$$

$$C2: 50,000 + 1,000 + 15,000 = 66,000 \text{ Rs.}$$

$$C3: 125,000 + 3,000 + 13,000 = 141,000 \text{ Rs.}$$

The unit costs of manufacturing are the following:

$$C1: 45,000/100 = 450 \text{ Rs/unit}$$

$$C2: 66,000/200 = 330 \text{ Rs/unit}$$

$$C3: 141,000/100 = 1,410 \text{ Rs/unit}$$

### Question 9.1

What do you mean by relevant information and opportunity cost?

### Answer

*Relevant information* is the predicted future cost and revenue that differs among alternatives.

*Opportunity cost* is the maximum contribution to profit that is foregone when limited resources are used for a particular purpose.

**Question 9.2**

The budget for the Pratap University Press for the year 20XX is as follows:

Sales		1,100,000
Direct Material	280,000	
Direct Labour	320,000	
Overhead	<u>400,000</u>	<u>1,000,000</u>
Net Income		<u>100,000</u>

(Figures are in rupees)

The Press typically follows a cost-plus pricing system. Direct-material and direct-labour costs are computed, overhead is added at a rate of 125% of direct labour, and 10% of the total cost is added to obtain the selling price.

The sales manager has placed a Rs.22,000 bid on an order with a cost of Rs.5,600 direct labour. The customer informs her that she can have the business for Rs. 9,800, take it or leave it. If she accepts the order, total sales for 20XX will be Rs.1,119,800. The manager refuses the order ,saying, “I sell on a cost-plus basis. It is bad policy to accept orders at below cost. I would lose Rs.200 on the job.”

If the company’s annual fixed overhead is Rs.160,000, what would net income have been with the order? Without the order?

**Question 10.1**

Home Products Ltd. has two producing departments, Machining and Assembly, and two service departments, Personnel and Plant Maintenance. The company’s budget for April 2012 is as follows:

	Service Departments		Production Departments	
	Personnel	Plant Maintenance	Machining	Assembly
Direct department costs	Rs. 32,000	Rs. 70,000	Rs. 600,000	Rs. 800,000
Square Feet	2,000	1,000	10,000	25,000
Number of Employees	15	30	200	250

Allocate the personnel and plant maintenance costs to the producing departments using the step-down method.

**Answer**

The service department costs are Personnel and Plant Maintenance. Plant maintenance direct department costs are higher than that of the Personnel department. Hence its costs are to be allocated first.

*Step 1: Allocating Plant maintenance direct department costs of Rs. 70,000*

Basis: Square Feet

Costs for Personnel =  $32,000 + (70,000)[2,000/(2,000+10,000+25,000)] = 35,783.78$  Rs.

Costs for Machining =  $600,000 + (70,000)[10,000/(2,000+10,000+25,000)] = 618,918.92$  Rs.

Costs for Assembly =  $800,000 + (70,000)[25,000/(2,000+10,000+25,000)] = 847,297.30$ Rs.

*Step 2: Allocating Personnel department costs of Rs. 35,783.78*

Basis: Number of Employees

Costs for Machining =  $618,918.92 + (35,783.78)[200/(200+250)] = 634,822.82$  Rs.

Costs for Assembly =  $847,297.30 + (35,783.78)[250/(200+250)] = 867,176.74$  Rs.

### **Question 13 - 14.1**

Shoreline Marine Manufacturing applies factory overhead using machine hours and number of component parts as cost drivers. In 2011, actual factory overhead incurred was Rs. 134,000 and applied factory overhead was Rs. 126,000. Before disposition of under-applied or over-applied factory overhead, the cost of goods sold was Rs. 525,000, gross profit was Rs. 60,000, and ending inventories were the following:

Direct Material: Rs. 25,000, WIP: Rs. 75,000, Finished Goods: Rs. 150,000

- Was factory overhead under-applied or over-applied? By how much?
- Assume that Shoreline writes off over-applied or under-applied factory overhead as an adjustment to cost of goods sold. Compute adjusted gross profit.
- Assuming Shoreline prorates the over-applied or the under-applied amount based on end-of-the-year unadjusted balances, compute adjusted gross profit.

### **Answer**

Given: Actual factory overhead incurred = Rs. 134,000; Applied factory overhead = Rs. 126,000

*The overhead has been under-applied by Rs. 8,000 (= 134,000 – 126,000)*

Given: COGS = Rs. 525,000; Gross Profit before adjustment = Rs. 60,000;  
Rs. 8,000 is adjusted to COGS.

*Gross Profit after adjustment = 60,000 – 8,000 = 52,000 Rs.*

Given: WIP: Rs. 75,000; Finished Goods: Rs. 150,000; COGS = 525,000 Rs.

Under-applied cost applied to COGS (with proration) =  $(8,000)[525/(75 + 150 + 525)] = 5,600$  Rs.

Gross Profit after the application =  $60,000 – 5,600 = 54,400$  Rs.

**Question 13 – 14.2**

Rainbow Paint Co. uses a process-costing system. Materials are added at the beginning of a particular process, and conversion costs are incurred uniformly. Work in process at the beginning of the month is 40% complete; at the end, 20%. One gallon of material makes one gallon of product. Data follow.

Beginning inventory	550 gal
Direct materials added	7,150 gal
Ending inventory	400 gal
Conversion costs incurred	Rs.35,724
Cost of direct materials added	Rs.65,340
Conversion costs, beginning inventory	Rs. 1910
Cost of direct materials, beginning inventory	Rs. 3,190

Use the weighted-average method. Prepare a schedule of output in equivalent units and a schedule of application of costs to products. Show the cost of goods completed and cost of ending work in process.

**Answer****Step 1: Summarize the flow of physical units.**

Material processed = Beginning inv + DM added = 550 + 7,150 = 7,700 gallon

Completed = Material processed – End inventory = 7,700 – 400 = 7,300 gallon

Partially completed = 400 gallon (receiving 20 % conversion resources)

**Step 2: Calculate the output in terms of equivalent units.**

Equivalent number of units completed  
= 7,300 + (0.20)(400) = 7,380 units

**Note:**

- DM was received by all the 7,700 units.
- Conversion resources were received by 7,380 equivalent units.

**Step 3: Summarize the total costs to account for.**

DM cost, beginning inventory = 3,190 Rs.

Processing cost, beginning inventory = 1,914 Rs.

DM cost, for this month = 65,340 Rs.

Processing cost, for the month = 35,724 Rs.

Costs to account for = 3,190 + 1,914 + 65,340 + 35,724 = 106,168 Rs.

**Step 4: Calculate unit costs.**

*For DM*

$$\begin{aligned} & [\text{Beginning Inv (Rs)} + \text{DM (Rs)}] / [\text{Beginning Inv (units)} + \text{DM (units)}] \\ & = [3,190 + 65,340] / [550 + 7,150] = 68,530 / 7,700 = 8.90 \text{ Rs/unit} \end{aligned}$$

*For Conversion*

$$\begin{aligned} & [\text{Conversion Cost last month} + \text{Con Cost this month}] / \text{Eq. units for conversion (units)} \\ & = [1,914 + 35,724] / 7,380 = 37,638 / 7,380 = 5.10 \text{ Rs/unit} \end{aligned}$$

**Step 5: Apply costs to units completed and to units in the ending WIP.**

*Costs applied to all completed units*

Number of completed units = 7,300 units

Costs applied to all completed units

$$\begin{aligned} & = (\text{Number of completed units})(\text{Unit cost for DM} + \text{Unit cost for conversion}) \\ & = (7,300)(8.90 + 5.10) = (7,300)(14) = 102,200 \text{ Rs.} \end{aligned}$$

*Costs applied to units not completed:*

Number of units not completed = 400

For DM, costs applied

$$= (\text{Number of units not completed})(\text{Unit cost for DM cost application}) = (400)(8.90) = 3,560 \text{ Rs}$$

For conversion, costs applied

$$\begin{aligned} & = (\text{No. of units not completed})(\% \text{ completed})(\text{Unit cost for conversion cost application}) \\ & = (80)(5.10) = 408 \text{ Rs} \end{aligned}$$

Total costs applied to units not completed = 3,560 + 408 = 3,968 Rs.

**Question 15 – 16.1**

What is a master budget? What are the important components of a master budget for a manufacturing organization?

**Answer**

A master budget is a quantitative expression of management plan.

The important components of a master budget for a non-manufacturing organization are the following:

- A. Operating Budget
  - 1. Sales budget
  - 2. Purchase budget

3. COGS budget
  4. Operating expenses budget
  5. Budgeted income statement
- B. Financial Budget
1. Capital budget
  2. Cash budget
  3. Balance sheet.

### Question 15 – 16.2

The inventory of Kharagpur Appliance Company was Rs. 210,000 on May 31. The manager was upset because the inventory was too high. She has adopted the following policies regarding merchandise purchases and inventory. At the end of any month, the inventory should be Rs. 15,000 plus 90% of the cost of goods to be sold during the following month. The cost of merchandise sold averages 60% of sales. Purchase terms are generally net 30 days. A given month's purchases are paid as follows: 20 % during that month and 80% during the following month.

Purchases in May had been Rs.150,000. Sales are expected to be June, Rs.300,000; July, Rs.280,000; August, Rs.340,000, and September, Rs.400,000.

- a. Compute the amount by which the inventory on May 31 exceeded the manager's policies.
- b. Prepare budget schedules for June July, and August for purchases and for disbursements for purchases.

### Answer

Following the inventory policy the May end inventory should have been

$$15,000 + (0.90)(\text{June COGS}) = 15,000 + (0.90)(0.60)(\text{June Sales}) = 15,000 + (0.54)(\text{June Sales})$$

$$= 15,000 + (0.54)(300,000) = 15,000 + 162,000 = 177,000 \text{ Rs.}$$

Actual May end inventory = 210,000 Rs.

The amount by which inventory on May 31 exceeded the manager's policy

$$= 210,000 - 177,000 = 33,000 \text{ Rs.}$$

	June	July	August	September
<b>Schedule c: Purchases Budget</b>				
Sales	300,000	280,000	340,000	400,000
COGS (= 60 % of sales)	180,000	168,000	204,000	240,000
90% of COGS of the next month	151,200	183,600	216,000	
Desired end inventory (=15,000 + 90% of COGS of the next month )	<u>166,200</u>	<u>198,600</u>	<u>231,000</u>	
Quantity needed (=Des end inv + COGS)	346,200	366,600	435,000	
Beginning inventory (= 210,000 for June, = Beginning inv + Purchases – Sales, all in the	210,000	46,200	86,600	

previous month, for July and August) Purchases (= Qty needed – Beg inv)	136,200	320,400	348,400	
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	June	July	August	September
<b>Schedule c: Disbursements for Purchases</b>				
Purchases	136,200	320,400	348,400	
Payment for the current month (20% of the current month's purchase)	27,240	64,080	69,680	
Payment for the previous month (80% of the previous month's purchases)	<u>120,000</u>	<u>108,960</u>	<u>256,320</u>	
Total disbursement	<u>283,440</u>	<u>173,040</u>	<u>326,000</u>	

### Question 15 – 16.3

Khan Leather Company makes a variety of leather goods. It uses standard costs and a flexible budget to aid planning and control. Budgeted variable overhead at a 45,000-direct-labour-hour level is Rs.27,000.

During April the company had an unfavourable variable-overhead efficiency variance of Rs.1,150. Material purchases were Rs.241,900. Actual direct-labour costs incurred were Rs.140,700. The direct-labour usage variance was Rs.5,100 unfavourable. The average wage rate was Rs.0.20 lower than the average standard wage rate.

The company uses a variable-overhead rate of 20% of standard direct-labour cost for flexible-budgeting purposes. Actual variable overhead for the month was Rs.30,750.

Compute (a) standard direct-labour cost per hour, (b) actual direct labour-hours worked, (c) total direct-labour price variance, (d) total flexible budget for direct-labour costs, (e) total direct-labour cost variance, and (f) variable-overhead spending variance in total. Indicate in each case whether the computed amount is favourable (F) or unfavourable (U).

### Answer

Given: Budgeted variable O/H cost = Rs.27,000; and Budgeted DL-hour = 45,000  
Variable O/H rate = (0.2)(Standard DL cost per hour)

Variable O/H rate =  $27,000/45,000 = 0.60$  Rupee per labour hour

Standard DL cost per hour = Variable O/H rate/0.2 = 3 Rs/h

Given: Actual DL cost = Rs. 140,700

Actual wage rate = Standard DL cost per hour – 0.2 =  $3 - 0.2 = 2.8$  Rs/h

Actual DL-hours worked = Actual DL cost/ Actual wage rate =  $140,700/2.8 = 50,250$  hours

$$\begin{aligned} \text{Total DL price variance} &= (\text{Actual wage rate} - \text{Standard wage rate})(\text{Actual DL used}) \\ &= (2.8 - 3)(50,250) = 10,050 \text{ (F)} \end{aligned}$$

Given: DL usage variance = 5,100 Rs.

$$\begin{aligned} \text{DL usage variance} &= (\text{Actual DL hours used} - \text{Standard DL hours used})(\text{Standard wage rate}) \\ &= (50,250 - \text{Standard DL hours used})(3) = 5,100 \end{aligned}$$

$$\text{Standard DL hours used} = 50,250 - 1,700 = 48,550$$

$$\begin{aligned} \text{Flexible budget for direct-labour costs} &= (\text{Actual DL-hour})(\text{Standard wage rate}) \\ &= (50,250)(3) = \text{Rs.}145,650 \end{aligned}$$

$$\begin{aligned} \text{Total DL cost variance} &= \text{Actual DL cost} - \text{Flexible budget DL cost} \\ &= 140,700 - 145,650 = 4,950 \text{ Rs. (F)} \end{aligned}$$

Given: Actual variable overhead for the month = Rs.30,750.

$$\begin{aligned} \text{Budgeted variable overhead} &= (\text{Standard DL-hour})(\text{Standard Variable O/H rate/hour}) \\ &= (48,550)(0.60) = \text{Rs.}29,130 \end{aligned}$$

$$\begin{aligned} \text{Variable-Overhead Spending Variance} &= (\text{Actual DL-hour cost} - \text{Standard DL-hour cost}) \\ &= (30,750 - 29,130) = 1,620 \text{ Rs. (U)} \end{aligned}$$

Given: Variable O/H efficiency variance = 1,150 (U)

$$\text{Variable O/H price variance} = 1,620 - 1,150 = 470 \text{ Rs. (U)}$$

### Question 12, 17 – 19.1

Ashok and two of his friends started a consulting firm.

1. They contributed Rs. 500,000 each.
2. They took a 10-year loan of Rs. 1,000,000 from a bank at an interest rate of 12% per year.
3. They rented a house for a monthly rental of Rs. 10,000 and had to pay three months' advance payment that was to be adjusted at the end of every month.
4. The first assignment for them was to conduct a productivity improvement study for Rs. 1,000,000 for a company for which they received an initial payment of Rs. 200,000.
5. For this study they hired an analyst who was to be paid Rs. 80,000 per month.
6. At the end of every month the interest on the loan was paid and the rental was adjusted against the advance given.
7. The analyst was paid Rs. 50,000 at the end of the month.
8. The travel cost to carry out the consulting work came to Rs. 200,000, half of which was paid by cash, and the other half remained to be paid later.

Prepare the T-accounts for the operations and the balance sheet at the end of the first month of operation.

**Answer**

## ACCRUED SALARY PAYABLE

Dr.	Cr.
	7. 30,000
	30,000

### *Balance Sheet*

Assets (Rs)	Liabilities and Owners' Equity (Rs)
Cash: 2,510,000	Paid-up Capital: 1,500,000
Advance: 20,000	Loans: 1,000,000
	A/Cs Payable: 100,000
	Accrued Salary Payable: 30,000
	Client Advance: 200,000
	Retained Earning: (300,000)
Total: 2,530,000	Total: 2,530,000

### **Question 12, 17 – 19.2**

Fill in the missing values in the table given below.

Assets (Rs)		Liabilities (Rs)	
Fixed Assets	—	Paid-up Capital	50,000
Cash	—	Retained Earning	—
Inventory	—	Current Liabilities	46,000
Accounts Receivables	—		
Total	—	Total	—

Given:

Average Collection Period = 30 days (Take 1 year has 360 working days)

Net Profit Margin = 0.10

Sales = 60,000 Rs/year

Dividends = Rs. 4,000

Administrative and Selling Expenses = Rs. 2,000

Inventory Turnover Ratio = 3.0

Current Ratio = 1

**Answer**

Inventory Turnover Ratio = 3.0 = Sales/Inventory = 60,000/ Inventory  
*Inventory* = 60,000/3 = 20,000 Rs.

Current Ratio = 1 = Current Assets/Current Liabilities = Current Assets/46,000  
 Current Assets = 46,000 = Cash + Inventory + A/Cs Receivables = Cash + 20,000 + A/Cs Receivables  
 Cash + A/Cs Receivables = 26,000 Rs.

Net Profit Margin = 0.10 = Net Profit/Sales = Net Profit/60,000  
 Net Profit = (0.10)(60,000) = 6,000 Rs.

*Retained Earning* = Net Profit – Dividends = 6,000 – 4,000 = 2,000 Rs.

*Total Liabilities* = Paid-up capital + Retained Earning + Current Liabilities  
 = 50,000 + 2,000 + 46,000 = 98,000 Rs.

*Total Assets* = Total Liabilities = 98,000 Rs.

Average Collection Period = 30 = Receivables/(Sales/360) = Receivables/(60,000/360)Receivables  
 = (30)(60,000)/360 = 5,000 Rs

Cash + A/Cs Receivables = 26,000 Rs. = Cash + 5,000  
 Cash = 26,000 – 5,000 = 21,000 Rs.

Total Assets = 98,000 = Fixed Assets + Cash + Inventory + Accounts Receivables  
 = Fixed Assets + 21,000 + 20,000 + 5,000 = Fixed Assets + 46,000

*Fixed Assets* = 98,000 – 46,000 = 52,000 Rs.

Assets (Rs)		Liabilities (Rs)	
Fixed Assets	52,000	Paid-up Capital	50,000
Cash	21,000	Retained Earning	2,000
Inventory	20,000	Current Liabilities	46,000
Accounts Receivables	5,000		
Total	98,000	Total	98,000

### Question 21– 24.1

What do you mean by discount rate? What are the determinants of discount rate?

#### Answer

Discount rate represents the way money now is worth more than money later. It indicates by how much a future amount is reduced to make it correspond to an equivalent amount today. It is similar to an interest rate, but, as a concept, it is different from interest rate. Whereas the former represents a real change in value to a person or group, as determined by their possibilities for productive use of the money and the effects of inflation, the latter narrowly defines a contractual agreement between a borrower and a lender.

In general, discount rate is greater than the interest rate (or cost of capital), because of the following:

- Investors borrow money because they hope to get a profit, the difference between their discount rate and the interest rate.

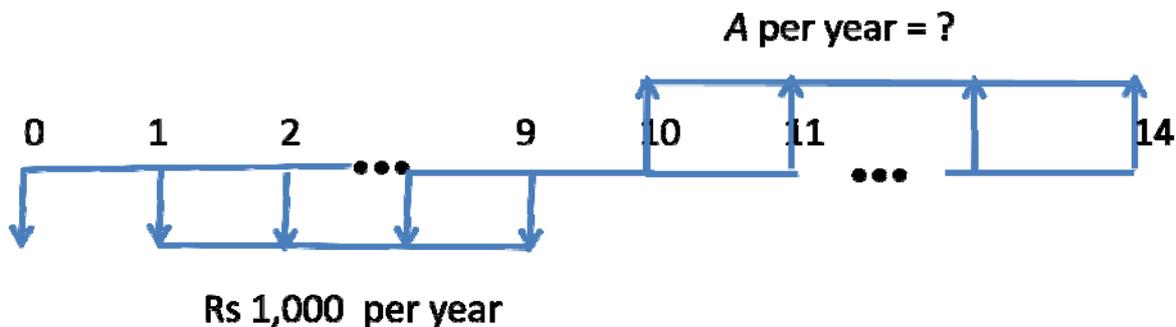
- Bankers would never lend their money unless they are pretty sure that the borrower gets more than the interest rate and pay back the loan in time.

Discount rate is also the minimum attractive rate of return (MARR) for an individual or group.

**Question 21– 24.2**

A person deposits Rs. 1,000 every year for 10 years starting from the beginning of current year and wishes to get back a constant amount every year for the next 5 years, starting from the end of the 10<sup>th</sup> year. At an annual interest rate of 10 percent, what annual amount will he get back? Draw the cash flow diagram.

**Answer**



Equivalence of cash outflow at the end of 9<sup>th</sup> year and of cash inflow at the beginning of 10<sup>th</sup> year (same as the end of 9<sup>th</sup> year) leads to

$$(1,000)(F/P, 0.10, 9) + (1,000)(F/A, 0.10, 9) = (A)(P/A, 0.10, 5)$$

$$(1,000)(2.35795) + (1,000)(13.57948) = (A)(3.79079)$$

$$A = 15,937.43/3.79079 = 4,204.25 \text{ Rs./year}$$

**Question 21– 24.3**

A 20-year bond with a face value of Rs.5,000 is offered for sale at Rs.3,800. The nominal rate of interest on the bond is 7%, paid semiannually. This bond is now 8 years old (i.e., the owner has received 16 semiannual interest payments). If the bond is purchased for Rs.3,800, what effective annual rate of interest would be realized on this investment opportunity?

**Answer:**

The remaining life of the bond is 12 (= 20 – 8) years.

The semi-annual receipts amount to  $(0.07/2)(5,000) = 175$  Rs.

There are 24 semi-annual payments.

The amount of Rs. 5,000 will be received at the end of 12 years.

So

$$3,800 = (175)(P/A, r\%, 24) + (5,000)(P/F, r\%, 24)$$

$$\text{Taking } r = 5\%, (175)(P/A, r\%, 24) + (5,000)(P/F, r\%, 24) = 3,965.25$$

$$\text{Taking } r = 6\%, (175)(P/A, r\%, 24) + (5,000)(P/F, r\%, 24) = 3,431.25$$

Interpolating  $(175)(P/A, r\%, 24) + (5,000)(P/F, r\%, 24) = 3,800$  at  $r = 5.30946\%$

The effective annual interest rate  $= (1 + r)^2 - 1 = 0.109 = 10.90\%$

#### **Question 21– 24.4**

What are the advantages and disadvantages of net present worth cost comparison method?

#### **Answer**

Net present worth cost comparison method has the following advantages:

- (1) It is simple.
- (2) It is applicable if the projects have the same life span.

The method has the following disadvantages:

- (1) It is not applicable to projects with differing lives.

#### **Question 21– 24.5**

Discuss where internal rate of return and the annual cost of comparison are used.

#### **Answer**

Internal rate of return is used when trying to find the economic feasibility of a single project.

Annual cost of comparison is used while making an economic comparison of projects with differing lives.

#### **Question 21– 24.6**

Find the effective annual interest rate if the annual interest rate is 10% compounded quarterly.

#### **Answer**

The effective annual interest rate is given by

$$r_e = (1 + r/4)^4 - 1 = (1 + 0.10/4)^4 - 1 = 0.10382 \text{ (10.382 \% per year)}$$

#### **Question 25 – 26.1**

Which assets depreciate over time and why?

#### **Answer**

Usually tangible assets (except land, rare paintings, etc.) age and their value decrease as time progresses. Depreciation occurs due to (1) physical depreciation, such as wear and tear and corrosion, (2) functional depreciation, such as decrease in productivity and obsolescence, and (3) minor accidents.

### **Question 25 – 26.2**

Why is depreciation accounting done? What is the philosophy underlying depreciation accounting?

#### **Answer**

Depreciation accounting is done to (1) estimate the loss of capital due to depreciation and recover the capital that is used up, (2) measure the value of an enterprise's unexpended assets, (3) charge the cost of depreciation to products/services, (4) help pricing, and (5) compute tax.

To account for depreciation of an asset in a year, the full purchase price of the asset is spread over its life and depreciation is charged to a particular year following one of the many popular depreciation accounting methods.

### **Question 25 – 26.3**

Name the common methods of depreciation accounting and state their characteristics.

#### **Answer**

The common methods of depreciation accounting and their characteristics are the following:

- The Straight-Line method - The value of an asset decreases at a constant rate
- Fixed-percentage (or Declining-Balance) Method -
- Double-Declining-Balance Method - The value of an asset decreases at a decreasing rate.
- Sum-of-the-Years-Digits Method - The value of an asset decreases at a decreasing rate.

### **Question 25 – 26.4**

Why is sinking-fund method of depreciation accounting not preferred in practice?

#### **Answer**

The sinking-fund method of depreciation accounting allows less depreciation in the beginning years of an asset and more and more depreciation as time progresses. That means the profit after depreciation is more in the beginning years and decreases as time progresses. It means that the taxes paid in the beginning years are more compared to the later years and hence the profit after taxes is less in the beginning years than the later years.

It is well known that the present worth of such a cash flow is less than when the cash flows are more in the beginning years than in the later years. This is the reason the owner of an asset rarely goes for sinking fund method of depreciation accounting.

### **Question 28.1**

What is management? Is it an art or science?

#### **Answer**

Management is concerned with efficient utilization of human, physical and financial resources, for socio-economic well-being of man, to the specific objectives of remunerative wages and good service conditions to employees, adequate return on investment, and quality product/service to the customer at the minimum price.

It is both an art and a science. It is an art because many decisions are taken based on observations, experience, and individual judgment. It is science because much of the real-life data can be organized and analyzed systematically and decisions then can be based on inferences drawn on the basis of scientific method of analysis of decision situations.

### **Question 28.2**

Briefly state the main contributions of Fredrick Taylor and Elton Mayo

#### **Answer**

Contributions of Fredrick Taylor are the following:

- Use the elements of 'the scientific method', rather than 'rules of thumb', for each element of a man's work.
- Management should plan the method of doing a work, rather than leave it to the worker to choose his/her own methods and select his/her own tools and equipment.
- Management must select the best worker for each particular task and then train, teach, and develop him, instead of allowing him to select his own task and train himself as best as possible.
- There should be equitable division of work and responsibility between management and worker.
- Introduced stop-watch time study.
- He introduced wage incentive systems to pay higher wages to more productive workers. The 'piece-rate system' is his idea.
- He suggested a 'functional organization' of flow of authority in which he called for managers with specialized knowledge to guide the workers to do their work efficiently. He thus introduced the idea that specialization can be achieved in managerial functions.

Contribution of Elton Mayo is the following:

Based on experiments that he carried out at Western Electric Company at Hawthorne, he developed the Humanistic School of Thought in Management Theory that showed that human factors are more important than technical and physical factors.

### **Question 28.3**

Match the management exponents with their contributions.

Fayol

Therbligs

Peter Drucker

Theory of Administration

Walter Schewhart	Operations Research
Frank and Lilian Gilbreths	MBO
Dantzig	Statistical Quality Control

**Answer**

Fayol	Theory of Administration
Peter Drucker	MBO
Walter Schewhart	Statistical Quality Control
Frank and Lilian Gilbreths	Therbligs
Dantzig	Operations Research

**Question 29.1**

State the generic functions of management.

**Answer**

They are many classifications of functions of management. One classification of the generic functions of management are (1) Planning, (2) Organizing, (3) Directing, and (4) Controlling.

**Question 29.2**

What are the different levels in management hierarchy and Briefly mention how they differ in their functions and skill requirements?

**Answer**

Management hierarchy generally consists of (1) Top-, (2) Middle-, and (3) Operating-level management.

The functions and skill requirements are tabulated for different levels of management:

	Top	Middle	Operating
Planning	High	Moderate	Low
Organizing	High	Moderate	Low
Directing	Low	Moderate	High
Controlling	Low	Moderate	High
Technical skill	Low	Moderate	High
Human skill	High	High	High
Conceptual skill	High	Moderate	Low

**Question 29.3**

What are the three broad groups of role of management?

**Answer**

The roles of management can be broadly grouped as the following:

1. Interpersonal role
2. Informational role
3. Decision role

**Question 29.4**

What do 6 M's stand for?

**Answer**

The 6 M's stand for (1) Man, (2) Machine, (3) Material, (4) Money, (5) Management, and (6) Management information system.

**Question 29.5**

Name the important stakeholders of a manufacturing organization.

**Answer**

The important stakeholders of a manufacturing organization are (1) Owners, (2) Lending institutions, (3) Suppliers, (4) Customers, (5) Employees, and (6) Society

**Question 29.6**

What is a code of business ethics? State five ethical rules that should appear in a code of ethics for an organization .

**Answer**

A code of business ethics is a set of statements of policies, principles, or rules that guide ethical behavior of business firms.

Five ethical rules that can appear in a code of ethics for an organization are the following:

1. Conduct business in compliance with all laws.
2. Do not give bribes.
3. Convey true claims in product advertisements.
4. Racial, ethnic, religious, and sexual harassment at work is prohibited.
5. Demonstrate courtesy, respect, honesty, and fairness.

**Question 30–32.1**

What are different elements of planning?

**Answer**

The different elements of planning are the following:

- Selecting the goals and objectives
- Selecting alternative courses of action
- Deciding on the best course of action

### **Question 30–32.2**

What are salient features of vision and mission?

#### **Answer**

Vision is

- A dream, an aspiration, a passion, a shared mental image of some ideal future state that neither specify the means to achieve it nor is written down and made public.
- An emotional appeal to the members of the organization that inspires them to think big.

Mission is

- A tangible form of the vision
- An expression of the organization's beliefs, thrust and broad directions in which the organization will be navigated.
- An explicit statement of the organization's most fundamental intentions regarding (1) its obligation to stakeholders, (2) the scope of the organization, and (3) the skills to develop and the principal means to adopt to achieve the vision.

### **Question 30–32.3**

What is SWOT analysis?

#### **Answer**

SWOT analysis is an analysis of internal and external environment of an organization. The analysis of internal environment involves finding the strengths and weaknesses of the organization whereas the analysis of external environment involves finding the opportunities and threats. SWOT analysis helps in implementing appropriate strategies to take advantage of the opportunities and meet the threats with the help of its strengths and by overcoming its weaknesses.

### **Question 30–32.4**

What are the principal components of organizing?

#### **Answer**

The principal components of organizing are (1) rational grouping of enterprise activities for allocation to departments, sections or individuals, (2) delegating authority to individual managers, (3) designing the organization structure, and (4) coordinating the activities

**Question 30 – 32.5**

What is an organization chart?

**Answer**

It is a pictorial representation of the formal relationships with regard to authority, responsibilities, and communication in a formal organization. It shows the superior-subordinate authority relationships and the functional interdependency of the units and the individual members of the organization.

**Question 30 – 32.5**

What are line and staff functions?

**Answer**

A line function is one that can be implemented, whereas a staff function is advisory.

**Question 30 – 32.6**

What do you mean by unity of command and span of control?

**Answer**

Unity of command refers to the principle of each member of an organization reporting to no more than one superior.

Span of control refers to the principle of limiting the number of subordinates a manager can effectively supervise to 4 or 5. With information technology playing an effective role and with knowledge workers, the span of control can exceed this traditional limit.

**Question 30 – 32.7**

What are the basic principles of humanistic school of thought in organization theory?

**Answer**

The basic principles of humanistic school of thought are the following:

- Concern for human reaction and social values (emotions, sentiment, prejudice)
- Importance attached to group reaction to organizational change
- Leadership (the power to influence the group behaviour) instead of headship.
- Motivation instead of compulsion

**Question 30 – 32.7**

What are the human needs recognized by Maslow?

**Answer**

The human needs recognized by Maslow are (1) physiological needs, (2) safety needs, (3) social needs, (4) esteem needs, and (5) self-actualization needs.

**Question 30 – 32.8**

What is Herzberg's two-factor theory?

**Answer**

Herzberg's two-factor theory divides the factors influencing worker motivation into two classes: (1) hygiene or motivational factors and (2) motivational factors. The former, if deficient, will de-motivate a worker. Examples of the maintenance factors are: (1) wages, salaries, and other benefits, (2) working conditions and job security, and (3) interpersonal relations. The latter, if present, will motivate a worker. Examples of the motivational factors are: (1) the nature of the job, (2) recognition and satisfaction of having done the job, (3) achievement, and (3) prospects of growth and achievement. It consists of

**Question 30 – 32.9**

What are the different elements of control?

**Answer**

The different elements of control are: (1) Goal, (2) Measured value of the system state, (3) Deviation of the measured value from the goal, (4) Decision to correct the deviation, (5) Action based on the decision, (6) Actual system state

**Question 30 – 32.10**

Cite five control techniques that are used in a manufacturing environment.

**Answer**

Control techniques that are used in a manufacturing environment are: (1) Standard cost, (2) Budgets, (3) Statistical process control, (4) Project networks, and (5) Audits

**Question 33.1**

Give five distinguishing features of products that differentiate them from services.

**Answer**

1. Products are tangible things that we can carry whereas services are not.
2. A product waits to be consumed, whereas service facilities wait to be rendered.
3. A product can be produced to inventory whereas a service cannot be inventoried.
4. Consumption can be delayed for a product whereas it cannot be delayed for a service.
5. Products are equipment intensive whereas services are labour intensive.

**Question 33.1**

What are different phases of a product life cycle. What are the characteristics of the Growth phase?

**Answer**

The phases of a product life cycle are: (1) Introduction, (2) Growth, (3) Maturity, and (4) Decline.

The characteristics of the Growth phase are low inventory, high backlog, high delivery delay, low and capacity and capacity expansion, and new competitors.

**Question 33.2**

What are the different stages of a new product development?

**Answer**

The stages of a new product development are: (1) Idea generation, (2) Screening, (3) Evaluation, (4) Development, (5) Test marketing, and (6) Commercialization

**Question 33.3**

Differentiate between diversification, product-line simplification, and standardization.

**Answer**

Diversification is adding new products or models to capture new market and achieving financial stability.

Product-line simplification is reducing the variety of products by dropping less profit-making products.

Standardization is establishing technical uniformity so to achieve ease of specification and interchangeability of parts and the advantages of low-cost production and high substitutability.

**Question 33.4**

Why is value engineering?

**Answer**

Value engineering is an organized, systematic study of the function of a material, component, product or service, with the objective of yielding value improvement through the ability to accomplish the desired function at the lowest cost without degradation of quality.

It is achieved by designing products/services that offer functional value with the minimum cost.

**Question 34 – 36.1**

Match the following regression techniques with the forecast horizon time:

- |                      |                   |
|----------------------|-------------------|
| Regression analysis  | Long-term         |
| Delphi               | Short-term        |
| Time-Series analysis | Intermediate-term |

**Answer**

The regression techniques and the forecast horizon time match as follows:

- |                     |                   |
|---------------------|-------------------|
| Regression analysis | Intermediate-term |
|---------------------|-------------------|

Delphi Long-term

Time-Series analysis Short-term

**Question 34 – 36.2**

State three differences between regression and correlation.

**Answer**

Regression can take place for two or more than two variables, whereas correlation is always between two variables.

Regression is asymmetric, whereas correlation is symmetric.

**Question 34 – 36.3**

What assumptions are made for a linear regression model?

**Answer**

The assumptions underlying a linear regression model are the following:

1. The explained variable is linearly dependent on the explanatory variables.
2. The explanatory variables are independent of one another.
3. The noise terms are independently and identically normally distributed with zero mean and constant variance.

**Question 34 – 36.4**

What are components of a time series?

**Answer**

The components of a time series are (1) average, (2) trend, (3) seasonality, (4) random noise, and (5) autocorrelation.

**Question 34 – 36.5**

Under what situations one selects the values of smoothing constant as 0.1 and 0.9?

**Answer**

A small value of smoothing constant is chosen when it is desired to smooth the random fluctuations.

A large value is chosen when it is desired to track the underlying changes in the data value.

**Question 37 – 40.1**

What do you mean by capacity of a manufacturing plant? What are the alternative ways of augmenting capacity of the plant?

**Answer**

Capacity of a manufacturing plant is its limiting capability to produce a certain output within a specified time period, normally expressed in terms of output units per unit time.

Capacity can be augmented by (1) overtime, (2) additional shifts per day, (3) subcontracting, and (4) new capacity addition.

**Question 37 – 40.2**

Each unit of the final product requires 4 units of part A. Part A is produced in a machine. The annual demand for the product is 20,000 units/year, percent defective  $f$  is 5 %, average machine utilization (due to breakdown) is 90 %, standard time for part A is 5 min/unit, the shop works for 3 shifts a day, with 8 hours per shift, but the idle time (due to shift hours not being fully utilized) is 25 %.

Find the number of machines required to produce the required number of parts A.

**Answer**

Considering scrap (5 %), the no. of part A required to be produced is

$$P = (20,000)(4)/(1 - 0.05) = 40,000/0.95 = 84,210 \text{ units/year}$$

3 shifts a day, 8 hours per shift and idle time 25 %.

The operating hours of the machine =  $(3)(8)(1 - 0.25) = 18.00 \text{ h/day}$

Assuming 25 working days a month, the available operating time for the machine in a year is

$$(18.00)(25)(12) = 5,400 \text{ hours/month}$$

Hence, the number of machines required is

$$[(5)(84,210)]/[(60)(5,400)(0.90) = 1.44$$

Thus, 2 machines are required to produce the required number of units of A.

**Question 37 – 40.3**

List five factors that are important for consideration for location of a steel plant

**Answer**

Five factors that are important for consideration for location of a steel plant are the following:

Proximity to iron ore mines, Availability of power and water, Availability of land, Availability of transport infrastructure, Political and social environment.

**Question 37 – 40.4**

Consider two candidate sites A and B, with the following costs:

<u>Location</u>	<u>Fixed Costs (Rs)</u>	<u>Variable Costs (Rs)</u>
A	1,200,000	200
B	800,000	300

Find the range of output for which each site is the best choice.

**Answer**

If  $x$  is the amount of output, then the breakeven output amount is given by

$$1,200,000 + 200x = 800,000 + 300x$$

Solving, the breakeven output = 400

Hence, location A is better when its output  $> 400$ , B is better when its output  $< 400$ , and both A and B give the same cost when output = 400.

**Question 37 – 40.5**

What are the different types of plant layout?

**Answer**

The different types of plant layout are: (1) Product (or Line) layout, (2) Process (or Functional) layout, (3) Group layout, and (4) Fixed layout.

**Question 37 – 40.6**

What are the differences between product and process layouts?

**Answer**

The product layout is preferred in mass production systems where the sequence of operations is the same for all products. The machines are arranged according to the sequence of operations. It results in low material handling costs, less in-process inventory, and in high utilization of space.

The process layout is preferred in job shops where the sequence of operations is different from one product to another. The machines are arranged according to functions (departments or sections). It results in high flexibility, and high-skilled workers are required here.

**Question 37 – 40.7**

What do you mean by line balancing?

**Answer**

A line balancing problem arises in a line layout where the problem is to allocate operations to workstations such that the operation sequence is maintained while the balance delay is the minimum.

**Question 37 – 40.8**

What is the objective of a good functional layout?

**Answer**

The objective of a good functional layout is to minimize the cost of transporting goods between work centers, i.e., to minimize the cost of transportation, which is equal to the sum of the products of the amount of materials moving between work centers and the distance travelled during the  $i$ th movement.

**Question 40 – 41.1**

What do you mean by production planning and what functions are carried out in a production planning department?

**Answer**

Production planning is concerned with translating overall sales orders and plans to specific schedules and meeting them by efficiently coordinating and integrating the factors of production.

The functions that are carried out in a production planning department are: Programming, Product Analysis and Routing, Scheduling and Loading, Authorization of Production, and Follow-up.

**Question 40 – 41.2**

Potential sales of two products manufactured by a shop are estimated as 500 and 700 units. Their unit sales prices are Rs. 10 and Rs. 15 respectively. The unit variable costs of the products are Rs. 2 and Rs. 3 respectively. The two products require 2 and 3 minutes per unit in machine A and 1 and 1.5 minutes in machine B. The total weekly machine times are 35 and 32 hours respectively. Formulate the problem as a linear programming model to find the number of units that the shop should produce to maximize its contribution to profit.

**Answer**

The problem is formulated as a linear programming problem as follows:

Let  $x_1$  and  $x_2$  be the numbers of units of the two products that should be produced by the shop in a week. We have to find the values of  $x_1$  and  $x_2$  that maximize the total contribution to profit.

$$\text{Maximize } (10 - 2)x_1 + (15 - 3)x_2$$

Subject to the sales constraints, the machine constraints, and the non-negativity restrictions:

$$x_1 \leq 500 \text{ and } x_2 \leq 700$$

$$2x_1 + 3x_2 \leq 35 \text{ and } x_1 + x_2 \leq 32$$

$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

**Question 40 – 41.3**

Apply the SPT rule for four jobs to be processed in one machine and find the completion times of the jobs, given the following data:

A: 10 min, B: 5 min, C: 12 min, and D: 8 min

**Answer**

The sequence of jobs to be processed following the shortest processing time (SPT) rule is the following:

Job sequence:	B – D – A – C
Processing times:	5, 8, 10, 12 min
Waiting times:	0, 5, 13, 23 min
Completion times:	5, 13, 23, 35 min

**Question 40 – 41.4**

Apply the Johnson's rule for a two-machine four-job problem, given the following data to find the optimal job sequence:

Job	Machine 1	Machine 2
1	3	3
2	1	6
3	5	4
4	2	3

**Answer**

The minimum operation time occurs for job 2 (operation time 1 min). Assign job 2 to machine 1.

We remove job 2. The remaining jobs to be assigned are jobs 1, 3, and 4.

The minimum operation time from among the operation times of the remaining jobs occurs for job 4 (operation time 2 min). Assign job 4 to machine 1 after job 2.

We remove job 4. The remaining jobs to be assigned are jobs 1 and 3.

The minimum operation time from among the operation times of the remaining jobs occurs for job 1 (operation time 3 min). There is a tie. We assign job 1 to machine 1 after jobs 2 and 4 are assigned.

Job 3 is assigned last.

The optimal sequence of jobs is: Job 2 – Job 4 – Job 1 – Job 3.

**Question 42-44.1**

Why is inventory kept?

**Answer**

The motives for keeping inventory are the following:

- Transaction motive – ensure synchronization of inflow and outflow (i.e., decouple them)
- Precautionary motive - A cushion against uncertainty
- Speculative motive – store in anticipation of future price rise
- Economic motive – take advantage of economic lot size

**Question 42-44.2**

Why is ABC analysis done? What are A-class items and what managerial actions are taken on these items?

**Answer**

ABC analysis is useful in multi-inventory situations in deciding where and to what extent the control should be exercised. A-class items consist of a small percentage of items accounting for a major proportion of the annual consumption. A-class items require tightest possible control, detailed record keeping, real-time updating, accurate control, regular review, small lot size, small buffer stock, and close follow up

**Question 42-44.2**

What are the assumptions made in deriving the basic EOQ model?

**Answer**

The assumptions made in deriving the basic EOQ model are the following:

1. Number of items is one.
2. Demand is deterministic.
3. No demand is lost or backordered.
4. Replenishment is instantaneous.
5. Unit price of the item is constant.
6. Set up cost is constant.

**Question 42-44.2**

The annual demand of an item is 10,000 units/year. The order cost is Rs. 48 per order. The holding charge is 2 %/month. The unit cost is Rs. 100 per unit. The supply lead time is 50 days. Find the economic order quantity and the reorder point.

**Answer**

$$\lambda = 10,000 \text{ units/year}, K = 48 \text{ Rs/order}, I = 0.02/\text{month} = 0.24/\text{year}, C = 100 \text{ Rs/unit}, \delta = 50 \text{ days.}$$

$$Q^* = \sqrt{(2 \lambda k / IC)} = \sqrt{[(2)(10,000)(48)] / [(0.24)(100)]} = 200$$

$$T = Q^* / \lambda = 200 / 1000 = 0.20 \text{ year} = 73 \text{ days}$$

$$\delta / T = 0.68.$$

$m$  = the largest integer less than or equal to  $\delta / T = 0$ .

$$\text{ROP} = \lambda(\delta - mT) = (10,000)(13.5) / (365) = 1,369 \text{ units}$$

**Question 42-44.3**

The average usage rate of an item is 200 units/day. The standard deviation of the daily demand is 4 units/day. The lead time is 16 days and the firm desires a service level of 95 %. Find the buffer stock and the reorder level.

**Answer**

Given

$$\mu_D = 200 \text{ units/day}, \sigma = 4 \text{ units/day}, L = 16 \text{ days},$$

$$\text{Service level} = 95 \%$$

$$\text{Buffer stock} = z(\sqrt{L}\sigma) = 1.645(\sqrt{16})(4) = 26.32 \text{ units}$$

It means that by keeping a buffer stock of 26.32 units, there will be 1 stock out in 20 (5 % = 100(1 - .95) % replenishment cycles.

$$\text{Reorder Level} = \mu_D L + z(\sqrt{L}\sigma) = (200)(16) + 26.32 = 3,226.32 \text{ units}$$

**Question 42-44.4**

Where is MRP used and how is MRP done?

**Answer**

Material requirements planning (MRP) is useful for the cases of dependent demand.

To carry out an MRP, one requires the following:

1. The master production schedule giving the gross requirements of the final product.
2. The bill of materials giving the number of subassemblies and parts required for one unit of the product.
3. The inventory file giving the receipts and issues giving the status of the inventory.
4. Information on the lead time to manufacture/buy.
5. With the help of the above-mentioned information, one
  - explodes the gross to net requirements
  - offsets the order for these requirements considering their lead times – a process of back scheduling.
  - orders lot-for-lot (i.e., the required amount).
  - generates the schedule of order and receipt of parts, subassemblies, and assemblies.

**Question 44-45.1**

Name the parties that are involved in a supply chain and mention the flows that take place among them.

**Answer**

The parties involved are the following component/raw-material suppliers, manufacturer, transporters, wholesalers/distributors, retailers, and customers

The flows that take place among them are flows of material, cash, and information.

#### **Question 44-45.2**

What are the three macro processes of supply chain?

#### **Answer**

The three macro processes of supply chain are:

1. **Customer relationship management (CRM)** - preparing catalog, managing web site, providing after-sales service,
2. **Internal supply chain management (ISCM)** - warehouse location and size, inventory management, packing, and shipping goods, and
3. **Supplier relationship management (SRM)** - Supplier selection, negotiation of supply terms.

#### **Question 44-45.3**

What supply chain parameters are affected by the design of supply chain distribution network?

#### **Answer**

The design influences response time, product variety, product availability, customer experience, time to market, order visibility, and returnability.

#### **Question 44-45.4**

What are the design options of a distribution network?

#### **Answer**

The design options of a distribution network are the following:

- Retail storage with customer pick-up
- Manufacturer storage with direct shipping
- Manufacturer storage with direct shipping and in-transit merge
- Distributor storage with packet carrier delivery
- Distributor storage with last-mile delivery
- Manufacturer/distributor storage with customer pick-up

**Question 44-45.5**

What is a cross docking?

**Answer**

Cross-docking is a supply chain practice of unloading materials from incoming material-carrying vehicles directly into outbound material-carrying vehicles, with little or no storage in between, thus combining materials from different origins into transport vehicles with the same or similar destination.

**Question 44-45.6**

What are the design options for a transportation network?

**Answer**

The design options for a transportation network are the following:

- Direct shipment network
- Direct shipping with milk runs
- All shipments via central DC
- Shipping via DC using milk runs
- Tailored network

**Question 44-45.7**

What are the design options for a transportation network?

**Answer**

Supply chain surplus represents the value addition by supply chain function of an organization. It is equal to the difference between the revenue generated from a customer and the total cost incurred to produce and deliver the product.

**Question 44-45.8**

Which contracts are used for product availability and supply chain profits?

**Answer**

The contracts used for product availability and supply chain profits are (1) Contracts for product availability, (2) Buyback or returns contracts, (3) Revenue-sharing contracts, and (4) Quantity flexibility contracts

**Question 46.1**

- a. What do you mean by “market?”
- b. Can a seller be a marketer?

**Answer**

- a. A market consists of all the potential customers sharing a particular need or want who might be willing and able to engage in exchange to satisfy that need or want.
- b. If several persons want to buy a plot of land, then these buyers are doing the marketing and are the marketers.

**Question 46.2**

What are the ways in which a market can be segmented?

**Answer**

Market segmentation can be

- geographic
- demographic (age: young and old, income: high, medium, and low, sex: male or female)
- Psychological (social class, lifestyle, personality characteristics)
- Behavioural (occasions, benefits, user status, usage rate, loyalty status, buyer readiness stage, and attitude)
- preferences toward product features (homogeneous, diffused, and clustered)

**Question 46.3**

On the basis of variety of products and markets what patterns of market coverage can a company think of?

**Answer**

1. Single-market concentration – Single-product single-market segment pattern
2. Product specialization – Single-product multiple market segment pattern
3. Market specialization – Multiple-product single-market segment pattern
4. Selective specialization – Selective multiple-product multiple-market segment pattern
5. Full coverage – multiple-product multiple-market segment pattern
6. Super segmentation – multiple-product multiple-market segment pattern pattern

**Question 46.4**

State five important marketing strategies that an entrepreneur can use.

**Answer**

Five marketing strategies are the following:

- Specializes in serving one type of end-use customer.

- Concentrates on selling to small customers
- Produces a specific product or even part of a product
- Provides unique product feature
- Produces low price high-quality products

### **Question 46.5**

What are the tools of market promotion?

#### **Answer**

Usually the following four tools are used for market promotion:

- Advertising – non-personal presentation
- Sales promotion – short-term incentives such as rebates, low-interest financing, lotteries, gifts, demonstrations
- Publicity – non-personal stimulation of demand such as trade shows, speeches, seminars, annual reports, charitable donations, public relations
- Personal selling – oral presentation such as sales meeting, telemarketing

### **Question 47.1**

What are the main forms of business organization?

#### **Answer**

The main forms of business organization are (1) Sole Proprietorship, (2) Partnership Firms, (3) Joint Hindu Family Business, (4) Cooperatives, (5) Private Limited Company, (6) Public Limited Company, (7) Limited Liability Partnership, (8) Companies within Section 25 of Companies Act, 1956, and (9) Franchise.

### **Question 47.2**

What are the advantages and disadvantages of sole proprietorship and partnership?

#### **Answer**

Sole proprietorship is a one-person organization with no legal formalities. But it is suitable for businesses that involve moderate risk, small financial resources, and small capital requirement. The proprietor has Unlimited liability and the business ceases to exist after the owner dies.

A partnership form of organization can be registered with the Registrar of Firms. The partners can share their experience in funding and managing the business. Here the risk is shared. It is appropriate for medium sized business involving limited capital such as small scale industries, wholesale and retail trade;

small service concerns like transport agencies, real estate brokers; professional firms like chartered accountants, doctors' clinic, attorney or law firms.

**Question 47.3**

State three important differences between a private limited company and a public limited company.

**Answer**

A private limited company is formed with 2 – 50 members whereas a public limited company is formed with a minimum of 7 members and with no maximum limit.

Transfer of shares in a private limited company is limited to its members, whereas shares can be freely transferred in a public limited company.

A private limited company need neither file a prospectus with the Registrar nor obtain the Certificate for Commencement of business, whereas these are required for a public limited company.

**Question 47.4**

State the main characteristics of a public liability partnership type of enterprise.

**Answer**

The main characteristics of a public liability partnership type of enterprise are the following:

- It combines the flexibility of a partnership and the advantages of limited liability of a company.
- It is useful for SMEs and for the enterprises in services sector, particularly for activities involving professionals.
- Such a company is governed by the Limited Liability Partnership Act 2008.
- It is a legal entity separate from its partners.
- The minimum number of partners in such a company is 2.
- It is incorporated with the Registrar of Societies.

**Question 47.4**

What are the main provisions for companies within Section 25 of Companies Act, 1956

**Answer**

The main provisions for companies within Section 25 of Companies Act, 1956 are the following:

- Such a company is established for promoting art, science, religion, social cause, sports, education, research, charity or any other activities with the sole objective to promote such activities.

- Profit, if any, is used to further the same objectives, not for payment of dividends.
- It is exempted from the requirement of minimum paid-up capital and payment of stamp duty for registration.
- It is a limited-liability company without the words “limited” or “private limited” appearing in its name.

#### **Question 48.1**

What is a Memorandum of Association? What are its main clauses?

#### **Answer**

A memorandum of association is a document that gives the essential facts about a new company intended to be formed. It is submitted to the Registrar of Companies. It has the following clauses: (1) Name, (2) Place of the Registered Office, (3) Objects, (4) Liability, (5) Authorized share capital, and (6) Name, address of subscribers, and number of equity shares held by each.

#### **Question 48.2**

What do you mean by essential commodities? State five products that are listed as essential commodities in India.

#### **Answer**

The essential commodities are those for which the government has the power to produce, supply and distribute. Five essential commodities include: (1) Cattle fodder, (2) Coal, (3) Cotton, (4) Drugs, and (5) Cotton.

#### **Question 48.3**

Name five products that are listed in the Reserved List of Products for small-scale sectors.

#### **Answer**

The five products are: (1) Bread, (2) Mustard oil, (3) Wax candles, (4) Safety matches, and (5) Steel almirah.

#### **Question 49.1**

State three components of equity funding and three components of debt funding.

#### **Answer**

Three components of equity financing are the following:

- (1) Common stock, (2) Preferred stock, and (3) Retained Earnings

Three components of debt financing are the following:

- (1) Debenture, (2) Term loan, and (3) Deferred credit

#### **Question 49.2**

State three main advantages of debt finance over equity finance.

**Answer**

Debt financing does not dilute the control over the company, whereas in equity financing the control is diluted for the existing owners.

Interests on debt are tax-deductible, whereas dividends to equity holders are not.

Issue cost is significantly lower for debt financing compared to that of equity financing.

**Question 49.3**

Differentiate between promissory notes, bonds, and debentures.

**Answer**

Promissory notes, given to banks, can generate funds needed for short-term (2 – 5 years) needs. Bonds and debentures help in generating funds for long-term needs.

Bonds are long-term unsecured notes issued by government, government undertakings, and financial institutions, whereas debentures are secured debts that are issued by private.

**Question 49.4**

How can an entrepreneur get working capital advance and what are the types of such advances?

**Answer**

Working Capital Advances are given by commercial banks against hypothecation (against movable property or inventory) or pledge (goods deposited with the banks). They can be (1) cash credits/overdrafts where a borrowing company can borrow as often as it needs, but not exceeding a pre-specified limit, (2) loans - a fixed amount, (3) purchase/discount of bills where the bank pays the company's purchase bill, and (4) letter of credit given by a bank undertaking the responsibility of meeting a company's purchase obligation and thus enabling the company to buy an asset/service.

**Question 49.5**

Differentiate between lease finance and hire-purchase and between a factor and a special purpose vehicle.

**Answer**

In case of lease finance, the owner receives payment from the user of an asset for a specified lease period, whereas in a hire-purchase scheme the hirer of an asset becomes the owner after the payment of the principal and the interests.

A factor is a financial institution to manage and finance credit sales, whereas a special-purpose vehicle (SPV) is a trustee that issues securities against a pool of assets of a company that are transferred to the SPV and whose cash flows are utilized to pay to the holders of these securities.

**Question 49.6**

State the characteristics of a venture capital form of financing.

### **Answer**

Venture capital form of financing is basically equity investment in young, risky, and prospective private companies. Capital is provided by venture capital firms (VCF). They do not need dividend or interest, but they want but need long-term capitalization and increased net worth of the company.

### **Question 50.1**

Briefly describe what you mean by *entrepreneurship*.

### **Answer**

Entrepreneurship is the professional application of knowledge, skills and competencies and/or of monetizing a new idea, by an individual or a set of people by launching an enterprise do novo or diversifying from an existing one, thus to pursue growth while generating wealth, employment, and social goal.

Important features of entrepreneurship are (i) innovation potential, (ii) risk-taking propensity, and (iii) venturing into new business for profit.

### **Question 50.2**

Mention five important principles of entrepreneurship.

### **Answer**

The five important principles of entrepreneurship are the following:

1. Challenge the status-quo.
2. Search for new ideas.
3. Make the product, process, or service simple and understandable.
4. Make the product, process, or service customer based.
5. Work, work, and work.

### **Question 50.3**

What is a business plan and what are its contents?

A business plan is a written document that details the proposed venture providing a roadmap for the enterprise. It helps the entrepreneur to view the project comprehensively, critically, and objectively and is a communication tool for the external stakeholders.

A business plan contains a description of the business, the opportunities in the market, the location of the enterprise, the financial aspects, the risks involved, the management structure, the milestones, and the successor details.

### **Question 50.4**

What considerations are made in feasibility analysis?

**Answer**

Usually technical, marketing, financial, organizational capability and competitor analysis are done in a feasibility analysis.