PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

QUESTIONS

Total Quality Management

1. Galaxy Ltd has a dedicated set of production facilities for an auto component – coded X pertaining to the gearbox of its leading car – GX2. With a vendor park set up in the vicinity of the parent manufacturing plant, the Just – in – Time system ensures that no stock of materials; work in progress or finished goods are held.

   At the beginning of the year 2009, the planned information relating to the production of component X through the dedicated facilities is as follows:

   (i) Each unit of component X has input materials; 5 units of materials A at ₹ 20 per unit and 4 units of materials B at ₹ 10 per unit.

   (ii) Variable cost per unit of component X (excluding materials) is ₹ 25 per unit worked on.

   (iii) Fixed costs of the dedicated facilities for the period: ₹ 250,000.

   (iv) It is anticipated that 7.5% of the units of X worked on in the process will be defective and will be scrapped.

   (v) It is estimated that customers will require replacement (free of charge) of faulty units of component X at the rate of 1 % of the quantity invoiced to them in fulfillment of order

   Galaxy Ltd. is pursuing a TQM philosophy. Consequently all losses will be treated as abnormal in recognition of a zero defect policy and will be valued at variable cost of production.

   Actual statistics for each of the years 2009-2011 for component X are shown given below–

	2009	2010	2011
Worked on in the process (units)	6,005	7,500	7,000
Invoiced to customers (units)	5,500	6,500	6,500
Total costs:			
Materials A and B (₹)	840,700	1,050,000	980,000
Variable costs of production (₹) (Excluding materials costs)	150,125	187,500	175,000
Fixed costs (₹)	287,500	262,000	290,000

   No changes have occurred from the planned price levels from materials, variable overhead or fixed overhead costs.

Actual free replacement of components X to customers were 250 units and 40 units in years 2010 and 2011 respectively.

Galaxy Ltd. authorized additional expenditure during the year 2010 and 2011 as follows:

2010: Equipment accuracy checks of ₹ 10,000 and staff training of ₹ 5,000.

2011: Equipment accuracy checks of ₹ 10,000 plus ₹ 15,000 of inspection costs; also staff training costs of ₹ 5,000 plus ₹ 3,000 on extra planned maintenance of equipment.

Required:

(a) Analyse the figures given above in table to check whether in the year 2009 actual results were achieved at the planned level in respect of (i) quantities and losses and (ii) units cost levels for material and variable costs.

(b) Use your analysis from (a) in order to calculate the value of the internal and external failure costs for year 2009

(c) Prepare an analysis for the years 2010 and 2011 which provide reconciliation between the number of components invoiced to customers with those worked–on in the production process. The analysis should show the change from the planned quantity of process losses and changes from the planned quantity of replacement of faulty components in customer hands;

(d) Prepare a cost analysis for the years 2010 and 2011 which shows actual internal failure costs, external failure costs, appraisal costs and prevention costs;

(e) Prepare a report, which explains the meaning and inter – relationship of figures given above in table and in the analysis in (a), (b), (c) & (d). The report should also give examples of each cost type and comment on their use in the monitoring and progressing of the TQM policy being pursued by Galaxy Ltd.

[Note: Ignore fractions in case of units]

Standard Costing

2. New Tech Enterprises manufactures one product, and the entire product is sold as soon as it is produced. There are no opening or closing stocks and work in progress is negligible. The company operates a standard costing system and analysis of variances is made every month. The standard cost card for the product is as follows:

		₹
Direct material	0.5 kgs at ₹ 4 per kg.	2.00
Direct Wages	2 hrs at ₹ 2 per hour	4.00
Variable overheads	2 hrs at ₹ 0.30 per hour	0.60
Fixed overheads	2 hrs at ₹ 3.70 per hour	7.40
Standard cost		14.00

Standard profit		6.00
Standard selling price		20.00

Budgeted output for April 2012 was 5,100 units.

Actual results for April 2012 were as follows:

Production of 4,850 units was sold for ₹ 95,600.

Materials consumed in production amounted to 2,300 kgs. At a total cost of 9,800.

Labour hours paid for amounted to 8,500 hours at a cost of ₹ 16,800.

Actual operating hours amounted to 8,000 hours.

Variable overheads amounted to ₹ 2,600.

Fixed overheads amounted to ₹ 42,300.

You are required to

(a) Calculate Material, Labour, Variable Overhead, Fixed Overhead, Sales Value & Sales Margin Variances.

(b) Prepare an operating statement for the month ended 30th April 2012.

(c) Prepare a reconciliation Statement between 'Budgeted Profit & Actual Profit' under 'Absorption Costing Method'.

(d) Prepare a reconciliation Statement between 'Budgeted Profit & Actual Profit' under 'Marginal Costing Method'.

(e) Prepare a reconciliation Statement between 'Standard Profit & Actual Profit' under 'Absorption Costing Method'.

☞ Part (d) & (e) has given only for additional revision.

Budget & Budgetary Control

3. Star Ltd. manufactures two products A and B. The summarised Balance Sheet of the company as at 31st March, 2012 is as under :–

Equity and Liabilities	(₹)
Shareholder's funds	
Share Capital	12,00,000
Reserve and Surplus	96,000
Current Liabilities	
Trade Payables	48,000
Short-Term Provisions	
Provision for Income Tax	60,000
	14,04,000

Assets	(₹)
Non-Current Assets	
Fixed Assets (Net)	9,00,000
Current Assets	
Inventories	3,54,000
Trade Receivables	90,000
Cash and Cash Equivalents	60,000
	14,04,000

The following information has been furnished to you for the preparation of the budget for the year ending 31st March, 2013:–

(i) Sales forecast :–

Product A 24,000 units at ₹ 30 per unit.

Product B 15,000 units at ₹ 40 per unit.

(ii) Raw materials :–

	Products	
	A	B
Material X @ ₹ 3 per kg.	2 kgs.	4 kgs.
Material Y @ ₹ 1 per kg.	1 kg.	2 kgs.

(iii) Direct Labour:–

Dep. P : 2 Hrs @ ₹ 1 per hour for A.

1 Hrs. @ ₹ 2 per hour for B.

Dep. Q: 1 Hrs. @ ₹ 3 per hour for A.

1 Hrs. @ ₹ 3 per hour for B.

(iv) Overheads :–

	Dept. P ₹	Dept. Q ₹
Fixed overheads per annum :–		
Depreciation	48,000	12,000
Others	96,000	30,000
Variable overheads per hour	0.50	1.50

(v) Inventories :–

(a) Raw materials :

	Opening stock		
	X	36,000 kgs.	₹ 1,14,000
	Y	6,000 kgs.	
	Closing stock		
	X	48,000 kgs.	
	Y	12,000 kgs.	
(b)	Finished goods :		
	Opening stock		
	A	600 Units	₹ 2,40,000
	B	6,000 Units	
	Closing Stock		
	A	6,600 units	
	B	3,000 units	

(vi) Selling, Distribution and Administration expenses are estimated at ₹ 1,80,900 per annum.

(vii) The cost of raw material purchases, direct wages, factory overheads, selling, distribution and administration overheads of the year will be met in full in cash during the year. The estimated position of debtors and creditors as on 31st March, 2013 is ₹ 1,50,000 and ₹ 48,000 respectively. Income tax provision standing at the beginning of the year will be paid during the year. Rate of income tax is 30%. An equipment purchased at ₹ 1,20,000 will be paid during the year.

You are required to prepare for the year ending 31st March, 2013:

(a) Cost of Goods Sold Budget

(b) Cash Budget

(c) Projected Balance Sheet as at 31st March, 2013 in the same format as given in the question.

The detailed working for each of the above should be shown.

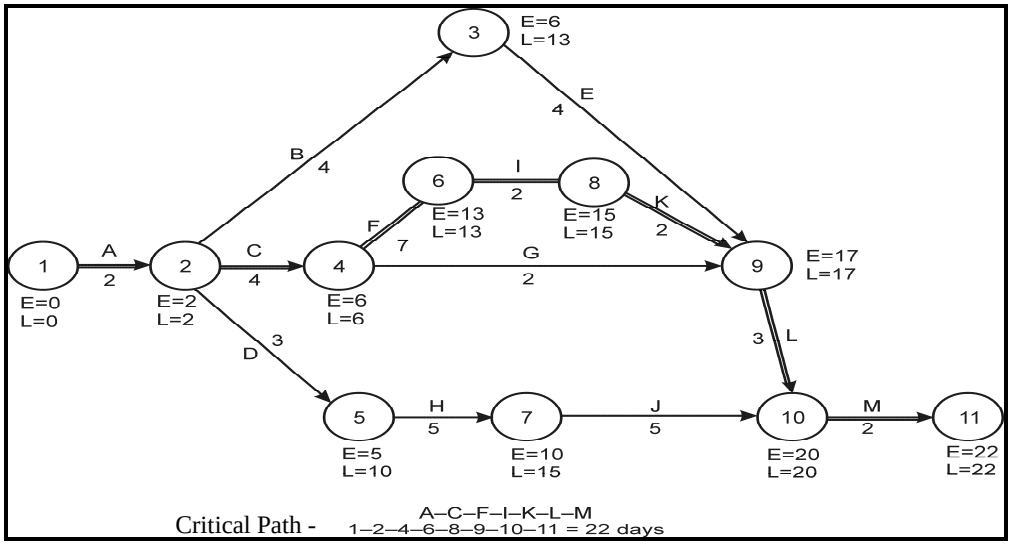
Program Evaluation and Review Technique

4. A project consisting of thirteen activities having duration and resource requirements shown below:

Activity	Duration (days)	Labourers required
A	2	2L

B	4	2C,2L
C	4	4C
D	3	2L
E	4	6C
F	7	2L
G	2	4C
H	5	4C,2L
I	2	2C
J	5	2C
K	2	2L
L	3	4L
M	2	4L

* L stands for labourers and C stands for carpenters



Analyse the project from the point of view of resources and to bring out the necessary steps involved in the analysis and smoothing of resources.

Decision Making on Shut Down of a Division

5. 'EXE' Ltd. manufactures a product called 'HN-2'. The company is organized into two divisions, viz., Division 'KXA' and Division 'KXB'. Division 'KXA' manufactures 'HN-2' and Division 'KXB', which manufactures the bottles, packs 'HN-2' in the bottles and stores

them by using a protective material called 'P-6'. The details of the expenses incurred by Division 'KXB' during 2011 are as under:

	₹
Direct materials including 'P-6'	5,25,000
Direct labour	3,75,000
Rent of a part of the warehouse used	33,750
Maintenance of Machine	27,000
Depreciation of machine	1,12,500
Miscellaneous overheads	1,18,125
Supervision	60,000
Administration overheads apportioned to the Division	1,80,000
	14,31,375

'WYE' Ltd. a company engaged in warehousing of a variety of a products, approached 'EXE' Ltd. to undertake to manufacture the bottles required on contract basis for a period of four years for ₹ 9,37,500 per annum and/or store the packed product for a further sum of ₹1,87,500 per annum.

Division 'KXB' uses a machine for the manufacture of bottles. This machine was installed four years ago at a capital cost of ₹ 9,00,000 and it has a useful life of four more years. It can be currently sold at ₹ 1,87,500.

Division 'KXB' purchased 'P-6' worth ₹ 7,50,000 during the last year. Out of this, one-fifth was used during the last year and the cost thereof is included in the material cost of 2011. The original purchase price of 'P-6' was ₹ 3,750 per tonne but, if sold now, the stock of 'P-6' would fetch only ₹3,000 per tonne. Its current replacement cost is ₹ 4,500 per tonne.

Division 'KXB' hired a warehouse for storage of the product for ₹ 67,500 per annum. It uses only half of the space and has taken only half the amount of rent into account. The remaining space of the warehouse is idle.

You are required to evaluate the following three proposals on a four-year term basis and state recommendations.

(a) If the contract for manufacture of the bottles and the storage of the product, 'HN-2' is given to 'WYE' ltd. Division 'KXB' will be close down. In that event the supervisory staff will be transferred to another department and there will be 100% saving in direct labour cost.

(b) If 'EXE' Ltd. continues to store the product 'HN-2' and leaves the manufacture of the bottles to 'WYE' Ltd., The machine in Division 'KXB' will not be required and the storage space requirements cannot be dispensed with. The supervisory staff will be

required to be retained in Division 'KXB' and only 10% of all material will be used. The saving on account of labour retrenchment will come to ₹ 18,750 per annum. The miscellaneous overheads will be reduced by 80%.

(c) If 'EXE' Ltd. continues to manufacture the bottles and leaves the storage of 'HN-2' to 'WYE' Ltd. Division 'KXB' will retain the machine and the warehouse space for use. The supervisory staff will also be retained and 90% of all materials will be required. The labour force will continue and the miscellaneous overheads will be reduced by 20%.

Costing of Service Sector

6. Modern health centre provides health and other related services to the citizens who are covered under insurance plan. The health centre receives a payment from the insurance company each time any patient attends the centre for consultation as under:

Consultations involving	Payment from Insurance company ₹
No treatment	30
Minor treatment	125
Major treatment	250

In addition, the adult patients will have to make a co-payment which is equivalent to the amount of payment for the respective category of treatment made by the insurance company. However, children and senior citizens are not required to make any such co-payment.

The health centre will remain open for 6 days in a week for 52 weeks in a year. Each physician treated 20 patients per day although the maximum number of patients that could have been treated by a physician on any working day is 24 patients.

The health centre received a fixed income of ₹ 20,000 per month for promotion of health products from the manufacture.

The annual expenditure of the health centre is estimated as under:

Materials and consumable (100% variable)	₹ 11,16,000
Staff salaries per annum per employee (fixed):	
Physician	₹ 2,25,000
Assistants	₹ 75,000
Administrative staff	₹ 45,000
Establishment and other operating costs (fixed)	₹ 5,00,000

The non-financial information is as under:

(i)	Staff:	
	Number of physicians employed	8
	Assistants	8
	Administrative staff	2
(ii)	Patient Mix:	
	Adults	50%
	Children	40%
	Senior Citizens	10%
(iii)	Mix of patient appointments (%)	
	Consultation requiring no treatment	60%
	Minor treatment	30%
	Major treatment	10%

Required:

(i) Calculate the Net income of the city health centre for the next year;

(ii) Determine the percentage of maximum capacity required to be utilized next year in order to break even.

Pricing of a Product

7. Computer Tec a manufacturing firm, has entered into an agreement of strategic alliance with Comp Inc. of United States of America for the manufacture of Super Computers in India. Broadly, the terms of agreement are:

(i) Comp Inc. will provide Computer Tec with kits in a dismantled condition. These will be used in the manufacture of the Super Computer in India. On a value basis, the supply, in terms of the FOB price will be 50% thereof.

(ii) Computer Tec will procure the balance of materials in India.

(iii) Comp Inc will provide to Computer Tec with designs and drawings in regard to the materials and supplies to be procured in India. For this, Computer Tec will pay Comp Inc. a technology fee of ₹ 8 crores.

(iv) Comp Inc. will also be entitled total royalty at 10% of the selling price of the computers fixed for sales in India as reduced by the cost of standard items procured in India and also the cost of imported kits from Comp Inc..

(v) Computer Tec will furnish to Comp Inc. detailed quarterly returns.

Other information available:

(a) FOB price agreed $2,040. Exchange rate to be adopted $1 = ₹ 55.00

(b) Insurance and freight – ₹ 2,000 per imported kit;

(c) Customs duty leviable is 200% of the CIF prices; but as a concession, the actual rate leviable has been fixed at 40% of CIF.

(d) The technology agreement expires with the production of 8,00,000 computers;

(e) The quoted price on kits includes a 25% margin of profits on cost to Comp Inc.

(f) The estimated cost of materials and supplies to be obtained in India will be 150% of the cost of supplies made by Comp Inc.

(g) 50% of the value in rupees of the locally procured goods represent cost of the standard items.

(h) Cost of assembly and other overheads in India will be ₹ 8,000 per Super Computer.

Required: Calculate the selling price, of a personal computer in India bearing in mind that Computer Tec Ltd has targeted a profit of 20% to itself on the selling price.

[Note: In making calculations, the final sum may be rounded to the next rupees]

Critical Path Analysis/ Program Evaluation and Review Technique

8. The following is a table showing details of a project.

Activity	Immediate Predecessor	Normal Time in weeks	Normal Cost (₹'000)	Crash Time in weeks	Crashing Cost (₹'000)
A	—	20	40	14	60
B	—	16	30	12	40
C	B	10	16	8	28
D	B	12	22	8	30
E	B	16	18	10	30
F	E	10	10	8	16
G	A, D, C	24	6	16	8

Indirect cost is ₹ 800 per day. Required:

(a) Draw the network and identify the critical path.

(b) What is the normal project duration?

(c) What is the associated cost?

(d) Find out crash cost slope of activities.

Transfer Pricing

9. Bright furniture Company has two divisions Division 'FXR' and Division 'FQR'. Both divisions are independent. Each division serves a different market in the furniture industry.

Division 'FXR' manufactures furniture that is use by the canteens/coffee bars. The division plans to introduce cushioned seat for the counter chairs. A cushioned seat currently made by the Division 'FQR' for use on its stylish stool could be modified for use on the new counter chair. Division 'FQR' can make the necessary modifications to the cushioned seat easily.

The raw materials used in Division 'FXR' seat are slightly different and should cost about 20 percent more than those used in Division 'FQR' stylish stool. However, the labour time should be the same because the seat fabrication operation is basically the same.

Division 'FQR' is operating at full capacity. By making the cushion seats for Division 'FXR', Division 'FQR' have to cut its production of stylish stools. However, Division 'FQR' can increase its production of normal stools. The labour time freed by not having to fabricate the frame or assemble the stylish stool can be shifted to the frame fabrication and assembly of the normal stool. Division 'FQR' can switch its labour force between these two models of stools without any loss of efficiency. Labour hours cannot be increase. Division 'FQR' has excess demand for both products. Following are Division 'FQR''s standard costs for the two stools and a schedule of Division 'FQR''s manufacturing overhead.

'FQR' DIVISION

Standard Selling Price and Cost

	Stylish Stool		Normal Stool	
	₹	₹	₹	₹
Selling price		225.00		160.00
Less: Raw materials				
Framing:	32.60		39.04	
Cushioned seat:				
Padding	9.60		-	
Vinyl	16.00		-	
Molded seat (purchased)	-	58.20	24.00	63.04
Less: Direct Labour				
Frame fabrication				
(0.5x₹30.00/DLH)	15.00		-	
(0.5x₹30.00/DLH)	-		15.00	

Cushion fabrication				
(0.5x₹30.00/DLH)	15.00		-	
Assembly*				
(0.5 x₹30.00/DLH)	15.00		-	
(0.3 x₹30.00/DLH)	-	45.00	9.00	24.00
Less: Manufacturing Overhead				
(1.5DLHx₹51.20/DLH)		76.80		-
(0.8DLHx₹51.20/DLH)		-		40.96
Profit/(Loss)		45.00		32.00

*Attaching seats to frames and attaching rubber feet.

'FQR' DIVISION

Manufacturing Overhead Budget

Overhead item	Amount ₹
Indirect Material (Variable-at current market prices)	16,80,000
Indirect labour (Variable)	15,00,000
Supervision (Non variable)	10,00,000
Power (Use varies with activity; rates are fixed)	7,20,000
Heat and light (Non variable-same regardless of production)	5,60,000
Miscellaneous overheads	8,00,000
(Non variable-any change in amounts or rates is independent of production)	
Depreciation (Fixed)	68,00,000
Employee benefits	23,00,000
(20% of supervision, direct and indirect labour)	
Total overhead	1,53,60,000
Capacity in DLH	3,00,000
Overhead rate/'DLH	₹ 51.20

Required:

Assume that you are the corporate controller. What transfer price would you recommend for a 200 unit lot of seats?

Learning Curve

10. The chief officer at manufacturing plant of '789 Dreamliner' aircraft observed that workers performing manufacturing operations at the plant showed signs of a definite learning

pattern. He noted that most aircraft manufacturing tasks experienced what he called an 80 percent learning rate, meaning that workers need 20 percent fewer hours to make a part each time their cumulative experience making that part doubled. Thus, if the first part took 100 minutes, the second would require 80 minutes, the fourth would require 64 minutes, and so on. Accordingly he requires calculating the time required for parts 41 to 60. [Note: learning coefficient is -0.322 for learning rate of 80%, log2=0.30103, log3=0.47712, log5=0.69897, Antilog of 1.484 =30.48, Antilog of 1.4274 =26.75]

Simulation

11. 'Super Egg Products' a retail shop deals in a perishable commodity. The daily demand and supply are variables. The data for the past 50 weeks show the following demand and supply:

Supply		Demand	
Availability (Kg)	No. of days	Demand (Kg)	No. of days
5	20	5	25
10	25	10	55
15	95	15	100
20	75	20	50
25	35	25	20

The retail shop buys the commodity at ₹20 per kg and sells it at ₹30 per kg. Any commodity remains at the end of the day, has no saleable value. Moreover, the loss (unearned profit) on any unsatisfied demand is ₹8 per kg. 'Supper Egg Products' retail shop opens five days in a week.

Given the following pair of random numbers, simulate 5 days sales, demand and profit.

(20, 32); (85, 65); (35, 17); (33, 07) (80, 45)

The first random number in the pair is for demand and the second random number is for supply.

Assignment

12. 'Air-Pacific' airways operating 7 days a week has given the following time-table. Crews must have a minimum layover of 5 hours between flights. Obtain the pairing flights and minimizes layover time away from home. For any given pairings the crew will be based at the city that results in the smaller layover:

Kolkata – Bangkok			Bangkok - Kolkata		
Flight Number	Depart.	Arrive	Flight Number	Depart.	Arrive
KX1	05:15 AM	07:15 AM	BX1	07:15 AM	09:15 AM

KX2	07:15 AM	09:15 AM	BX2	08:15 AM	10:15 AM
KX3	01:15 PM	03:15 PM	BX3	01:15 PM	03:15 PM
KX4	07:15 PM	09:15 PM	BX4	06:15 PM	08:15 PM

Linear Programming

13. Global Bank is in the process of formulating a loan policy that involves a maximum of ₹ 25 lakhs. The following table provides Interest Rate and Bad-Debt Ratio about available types of loans.

Type of loan	Interest Rate	Bad-Debt Ratio
Personal	0.135	0.09
Credit Card	0.145	0.12
Home	0.115	0.02
Farm	0.120	0.04
Commercial	0.105	0.01

Bank allocates at least 30% of the funds to farm and commercial loans. To assist the housing industry in the region, home loans must equal at least 50% of the personal, credit card and home loans. The bank also has a stated policy of not allowing the overall ratio of bad debts on all loans to exceed 5%. Formulate this as a Linear Programming Problem

Value Chain Analysis

14. Explain with a diagram the value chain activities within the firm with suitable classifications under primary and support activities and also the industry value chain indicating what the end use consumer pays for.

Theory of constraints (TOC)

15. Alfa Ltd. manufactures two products. Each product passes through two departments A and B before it becomes a finished product. The data for the year are as under:

Products	X	Y
(i) Maximum Sales Potential (in units)	7,400	10,000
(ii) Product unit data:		
S.P. p.u	₹ 90	₹ 80
Machine hours p.u.		
Department A hours @ ₹ 40/hr.	0.50	0.30
Department B hours @ ₹ 60/hr.	0.40	0.45

(i) Maximum capacity of Department A is 3,400 hours and Department B is 3,640 hours.

(ii) Maximum quantity of direct materials available is 17,000 kgs. Each product requires 2 kg. of direct materials. The purchase price of direct materials is ₹ 5/kg.

(a) You are required to formulate the information as a linear programming problem, with the objective of maximization the total profit, subject to the constraints mentioned above. (Only formulation is required. Solution is not needed).

(b) In view of the aforesaid production capacity constraints, the company has decided to produce only one of the two products during the year. Which of the two products should be produced and sold in the year to maximise profit? State the number of units of that product and relevant contribution.

Activity Based Cost Management (ABM)

16. (a) Differentiate between 'Value-added' and 'Non-value-added' activities in the context of Activity based costing. Give examples of Value-added and Non-value-added activities.

Costs Concepts

(b) Explain with one example each that sunk cost is irrelevant in making decisions, but irrelevant costs are not sunk costs.

CVP Analysis & Decision Making

17. (a) Explain, how Cost Volume Profit (CVP) - based sensitivity analysis can help mangers cope with uncertainty.

(b) In what circumstances it may be justifiable to sell at a price below marginal cost?

Balance Score Card

18. (a) Explain briefly the major components of a balanced score card.

Uniform Costing

(b) What are the requisites for the installation of a uniform costing system?

Transportation

19. (a) Explain the term degeneracy in a transportation problem.

Critical Path Analysis

(b) Explain 'Dummy Activity' in the context of a network.

Critical Path Analysis/ Program Evaluation and Review Technique

20. (a) "CPM is a deterministic model. However, PERT is a probabilistic model"-Explain.

Transportation

(b) A cement company has three plants producing cements and four depots. The cost of transporting cement from different plants to the depots, production capacity of each plant and requirement at different depots is shown in the following cost-matrix table:

Plants	Depots				Production Capacity
	CA	CB	CC	CD	
CX	6	8	6	5	1,200
CY	4	4	8	4	1,600
CZ	3	7	2	8	1,200
Requirements	1,200	800	600	1,400	4,000

Determine a transportation schedule so that the cost is minimized. The cost in the cost matrix is given in thousand of rupees.

SUGGESTED ANSWERS/HINTS

1. (a) (i)

	units
Components worked on in the process	6,005
Less: Planned defective units (7.5% of 6,005)	450
Less: Replacements to customers (1% of 5,500)	55
Components invoiced to customers	5,500

Therefore actual results agree with planned results

(ii) Planned component cost = (5 units x ₹ 20 for materials A) + (4 units x ₹ 10 for material B) + ₹ 25 variable cost = ₹ 165

Comparing with the data in the table:

Materials = ₹ 840,700/6,005 units = ₹ 140

Variable overhead = ₹ 150,125/6,005 units = ₹ 25

(b) Internal failure costs = ₹ 74,250 (450 units x ₹ 165)

External failure costs = ₹ 9,075 (55 units x ₹ 165)

(c)

	2010 (units)	2011 (units)
Components invoiced to customers	6,500	6,500
Planned replacement (1%)	65	65
Unplanned replacement (Total-Planned)	185	–25
	(250–65)	(40–65)
Components delivered to customers [A]	6,750	6,540
Components worked on in the process [B]	7,500	7,000
Total Process defects [C = B–A]	750	460
Planned process defects (7.5% of worked on In the process) [D]	562	525
Unplanned defects (balancing figure)[C–D]	188	– 65

(d)

	2010 (₹)	2011 (₹)
Internal failure costs	123,750 (750 units x ₹ 165)	75,900 (460 units x ₹ 165)
External failure costs	41,250	6,600
	{(65+185) units × ₹ 165}	{(65-25) units x ₹ 165}
Appraisal costs	10, 000	25,000
Prevention costs	5,000	8,000

(e) The following points should be included in the report:

1. Insufficient detail is provided in the statistics shown in the table thus resulting in the need to for an improvement in reporting.

2. The information presented in (c) indicates that free replacements to customers were 185 greater than planned in the year 2010 but 25 less than planned in the year 2011. In contrast, the in process defects were 188 more than planned (approximately 33%) in the year 2010 and 65 less than plan (approximately 12%) in the year 2011.

	2009 (₹)	2010 (₹)	Change w.r.t previous period (₹)	2011 (₹)	Change w.r.t previous period (₹)
Internal Failure Costs	74,250	123,750	49,500	75,900	(-)47,850
External Failure Costs	9,075	41,250	32,175	6,600	(-)34,650
Total	83,325	165,000	81,675	82,500	(-)82,500

3. Both Internal failure and External failure costs have increased substantially in the year 2010 but decreased significantly in the year 2011.

4. The additional failure cost w.r.t the year 2009 was ₹ 81,675 in the year 2010 and cost savings w.r.t. year 2010 were ₹ 82,500 in the year 2011

The above savings should be compared against the investment of Equipment accuracy checks of ₹ 10,000 and staff training of ₹ 5,000 in the year 2010 and investment of Equipment accuracy checks of ₹ 10,000 plus ₹ 15,000 of inspection costs; also staff training costs of ₹ 5,000 plus ₹ 3,000 on extra planned maintenance of equipment in the year 2011. It can be seen that the costs exceed the savings in the year 2010 but the savings exceeded the costs in the year 2011. There has also been an increase in both internal and external failure costs from the year 2009 to 2010. Investigations should be made relating to the likely time lag from incurring prevention/ appraisal costs and their subsequent benefits. Also it seems that expenditure on inspection of ₹ 15,000 and expenditure on extra planned maintenance of ₹ 3,000 in the year 2011 has yielded major results. This should be thoroughly analysed and be adopted as a successful tool to reduce failure cost. Reduced failures will also improve the brand equity and customer satisfaction of the product.

2. (a) Calculation of Variances:

1. Material Variances

[SP × SP]	[AQ × AP]	[AQ × SP]
(4,850 × 0.50) Kg. × ₹ 4 = ₹ 9,700	2,300 Kg. × ₹ 4.26* = ₹ 9,800	2,300 Kg. × ₹ 4 = ₹ 9,200

* ₹ 9,800 / 2,300Kg.

Note:
SQ = Standard Quantity = Expected Consumption for Actual Output
AQ = Actual Quantity of Material Consumed
SP = Standard Price per Unit
AP = Actual Price per Unit

Material Cost Variance = Standard Material Cost – Actual Material Cost
= SQ × SP – AQ × AP
= ₹ 9,700 – ₹ 9,800
= ₹ 100 (A)

Material Price Variance = AQ × SP – AQ × AP
= ₹ 9,200 – ₹ 9,800
= ₹ 600 (A)

Material Usage Variance = SQ × SP – AQ × SP
= ₹ 9,700 – ₹ 9,200
= ₹ 500 (F)

2. Labour Variances

[SH × SR]	[AH × AR]	[AH × SR]
(4,850 × 2) hrs × ₹ 2 = ₹ 19,400	8,500 hrs × ₹ 1.976* = ₹ 16,800	8,500 hrs × ₹ 2 = ₹ 17,000

* ₹ 16,800/8,500 hrs

Note:

SH = Standard Hours = Expected Time Allowed for Actual Output

AH = Actual Hours *paid for*

SR = Standard Rate per Labour Hour

AR = Actual Rate per Labour Hour Paid

Labour Cost Variance = Standard Wages – Actual Wages
= SH × SR – AH × AR
= ₹ 19,400 – ₹ 16,800
= ₹ 2,600 (F)

Labour Rate Variance = SR × AH – AR × AH
= ₹ 17,000 – ₹ 16,800
= ₹ 200 (F)

Labour Efficiency Variance = SH × SR – AH × SR
= ₹ 19,400 – ₹ 17,000
= ₹ 2,400 (F)

Labour Idle Time Variance = Actual Idle Hrs × Standard Rate per Hour
= 500 Hrs × ₹ 2
= ₹ 1,000

Labour Efficiency Variance = Labour Revised Efficiency Variance + Labour Idle Time Variance

Labour Revised Efficiency Variance = ₹ 2,400 (F) – ₹ 1,000 (A) = ₹ 3,400 (F)

3. Fixed Overhead Variance

Absorbed Fixed Overheads [SR@ × AO]	Budgeted Fixed Overheads [BO × SR@]	Actual Fixed Overheads [AO × AR]	Budgeted Overheads for Actual Hours [SR# × AH]
₹ 7.40 × 4,850 Units = ₹ 35,890	5,100 Units × ₹ 7.40 = ₹ 37,740	4,850 Units × ₹ 8.722* = ₹ 42,300	₹ 3.70 × 8,500 Hrs = ₹ 31,450

*₹ 42,300 / 4,850 Units

Note:

SR@ = Standard Fixed Overhead Rate per Unit

AO = Actual Output

BO = Budgeted Output

AR = Actual Fixed Overhead Rate per Unit

SR# = Standard Fixed Overhead Rate per Hour

AH = Actual Hours

Fixed Overhead Cost Variance = Absorbed Fixed Overheads – Actual Fixed Overheads

= ₹ 35,890 – ₹ 42,300 = ₹ 6,410 (A)

Fixed Overhead Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overhead

= ₹ 37,740 – ₹ 42,300 = ₹ 4,560 (A)

Fixed Overhead Capacity Variance = Budgeted Fixed Overheads for Actual Hours – Budgeted Fixed Overheads

= ₹ 31,450 – ₹ 37,740 = ₹ 6,290 (A)

Fixed Overhead Efficiency Variance = Absorbed Fixed Overheads – Budgeted Fixed Overheads for Actual hours

= ₹ 35,890 – ₹ 31,450 = ₹ 4,440 (F)

Fixed Overhead Volume Variance= Absorbed Fixed Overheads – Budgeted Fixed Overheads

= ₹ 35,890 – ₹ 37,740 = ₹ 1,850 (A)

Fixed Overhead Idle Time Variance = Standard Fixed Overhead Rate per Hour × Actual Idle Time (Hours)

= ₹ 3.70 × 500 Hrs= ₹ 1,850 (A)

Fixed Overhead Efficiency Variance	=	Idle Time Variance + Fixed Overhead Revised Efficiency Variance
Fixed Overhead Revised Efficiency Variance	=	₹ 4,440 (F) – ₹ 1,850 (A) = ₹ 6,290 (F)

4. Variable Overhead Variance

Standard Variable Overheads for Production [SR@ × AO]	Actual Variable Overheads [AO × AR]	Budgeted Variable Overheads for Actual Hours [SR# × AH]
₹ 0.60 × 4,850 Units = ₹ 2,910	4,850 Units × ₹ 0.536* = ₹ 2,600	₹ 0.30 × 8,500 Hours = ₹ 2,550

*₹ 2,600/4,850 Units

Note:

SR@	= Standard Variable Overhead Rate per Unit
AO	= Actual Output
AR	= Actual Variable Overhead Rate per Unit
SR#	= Standard Variable Overhead Rate per Hour
AH	= Actual Hours

Variable Overhead Cost Variance	=	Standard Variable Overheads for Production – Actual Variable Overheads
	=	₹ 2,910 – ₹ 2,600 = ₹ 310 (F)
Variable Overhead Expenditure Variance	=	Budgeted Variable Overheads for Actual Hours–Actual Variable Overheads
	=	₹ 2,550 – 2,600 = ₹ 50 (A)
Variable Overhead Efficiency Variance	=	Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual hours
	=	₹ 2,910 – ₹ 2,550 = 360 (F)
Variable Overhead Idle Time Variance	=	Standard Variable Overhead Rate per Hour × Actual Idle Hours
	=	0.30 × 500 Hrs = 150 (A)
Variable Overhead Efficiency Variance	=	Idle Time Variance + Variable Overhead Revised Efficiency Variance
Revised Efficiency Variance	=	₹ 360 (F) – 150 (A) = 510 (F)

5. Sales Value Variances

Budgeted Sales [BQ × BP]	Actual Sales [AQ × AP]	Standard Sales [AQ ×BP]
5,100 Units × ₹ 20 = ₹ 1,02,000	4,850 units × ₹ 19.71* = ₹ 95,600	4,850 × ₹ 20 = ₹ 97,000

* ₹ 95,600/ 4,850 units

Note:
BQ = Budgeted Sales Quantity
AQ = Actual Sales Quantity
BP = Budgeted Selling Price per Unit
AP = Actual Selling Price per Unit

Sales Variance = Actual Sales – Budgeted Sales
= AP × AQ – BP × BQ
= ₹ 95,600 – ₹ 1,02,000 = ₹ 6,400 (A)

Sale Price Variance = Actual Sales –Standard Sales
= AP × AQ – BP × AQ
= ₹ 95,600 – ₹ 97,000 = ₹ 1,400 (A)

Sales Volume Variance = Standard Sales – Budgeted Sales
= BP × AQ – BP × BQ
= ₹ 97,000 – ₹ 1,02,000= ₹ 5,000 (A)

6. Sales Margin Variances

Budgeted Margin [BQ × BM]	Actual Margin [AQ × AM]	Standard Margin [AQ × BM]
5,100 Units × ₹ 6 = ₹ 30,600	4,850 units × $\left[\frac{₹\ 95,600}{4,850\ \text{units}} \times ₹\ 14\right]$ = ₹ 27,700	4,850 units × ₹ 6 = ₹ 29,100

Note:
BM = Budgeted Margin
= (Budgeted Price per Unit – Standard Cost per Unit)
AM = Actual Margin
= (Actual Sales Price per Unit – Standard Cost per Unit)
BQ = Budgeted Sales Quantity
AQ = Actual Sales Quantity

Sales Margin Variance = Actual Margin – Budgeted Margin

= AQ × AM – BQ × BM

= ₹ 27,700 – ₹ 30,600

= ₹ 2,900 (A)

Sales Margin Price Variance = Actual Margin – Standard Margin

= AM × AQ – BM × AQ

= ₹ 27,700 – ₹ 29,100

= ₹ 1,400 (A)

Sales Margin Volume Variance= Standard Margin – Budgeted Margin

= BM × AQ – BM × BQ

= ₹ 29,100 – ₹ 30,600

= ₹ 1,500 (A)

OR

Sales Margin Volume Variance = [Sales Volume Variance × Budgeted Net Profit Ratio]

$= ₹\ 5{,}000\ (A) \times \left[\frac{₹\ 6}{₹\ 20} \times 100\right] = ₹\ 1{,}500\ (A)$

(b) Operating Statement for the month ended 30th April 2012:

Operating Statement	₹	₹
Sales		95,600
Less: Cost of Materials	9,800	
Labour	16,800	
Variable Overhead	2,600	
Fixed Overhead	42,300	71,500
Net Profit		24,100

(c) Reconciliation Statement between 'Budgeted Profit & Actual Profit' under 'Absorption Costing' method

Reconciliation Statement (Absorption Costing)

Budgeted Profit ⟶ Actual Profit

	₹	₹	₹	₹
Budgeted Profit				30,600

(Budgeted Quantity x Budgeted Margin)				
Effect of Variances				
Material Cost Variances:				
Material Price Variance		(600)		
Material Usage Variance		500	(100)	
Labour Cost Variances:				
Labour Rate Variance		200		
Labour Efficiency Variance (Rev.)		3,400		
Labour Idle Time Variance		(1,000)	2,600	
Variable Overhead Cost Variances:				
Variable Overhead Expenditure Variance		(50)		
Variable Overhead Efficiency Variance (Rev.)		510		
Variable Overhead Idle Time Variance		(150)	310	
Fixed Overhead Cost Variances:				
Fixed Variable Overhead Expenditure Variance		(4,560)		
Fixed Overhead Capacity Variance	(6,290)			
Fixed Overhead Idle Time Variance	(1,850)			
Fixed Overhead Efficiency Variance (Rev.)	6,290	(1,850)	(6,410)	
Sales Margin Variance:				
Sales Margin Price Variance		(1,400)		
Sales Margin Volume Variance		(1,500)	(2,900)	(6,500)
Actual Profit				24,100

Adverse shown by (–) symbol

(d) Reconciliation between 'Budgeted Profit & Actual Profit' under 'Marginal Costing' Method

Reconciliation Statement (Marginal Costing)

Budgeted Profit ⟶ Actual Profit

	₹	₹	₹	₹
Budgeted Profit (Budgeted Quantity x Budgeted Margin)				30,600

Effect of Variances				
Material Cost Variances:				
Material Price Variance		(600)		
Material Usage Variance		500	(100)	
Labour Cost Variances:				
Labour Rate Variance		200		
Labour Efficiency Variance (Rev.)		3,400		
Labour Idle Time Variance		(1,000)	2,600	
Variable Overhead Cost Variances:				
Variable Overhead Expenditure Variance		(50)		
Variable Overhead Efficiency Variance (Rev.)		510		
Variable Overhead Idle Time Variance		(150)	310	
Fixed Overhead Cost Variances:				
Fixed Variable Overhead Expenditure Variance		(4,560)		
Fixed Overhead Capacity Variance	NA			
Fixed Overhead Idle Time Variance	NA			
Fixed Overhead Efficiency Variance (Rev.)	NA	NA	(4,560)	
Sales Margin Variance:				
Sales Margin Price Variance		(1,400)		
Sales Margin Volume Variance*		(3,350)	(4,750)	(6,500)
Actual Profit				24,100

Adverse shown by (–) symbol

☞ Calculation of Sales Margin Volume Variance

* Sales Margin Volume Variance (Marginal Costing)	=	(Standard Contribution per Unit × (Actual Quantity – Budgeted Quantity)
	=	₹ 13.40 × (4,850 Units – 5,100 Units)
	=	3,350 (A)
	Or	
* Sales Margin Volume Variance (Marginal Costing)	=	Sales Volume Variance × Budgeted PV Ratio
	=	₹ 5,000 (A) × (₹ 13.40/20.00 × 100) %
	=	3,350 (A)

(e) Reconciliation between 'Standard Profit & Actual Profit' under 'Absorption Costing' method

Reconciliation Statement (Absorption Costing)

Standard Profit ⟶ Actual Profit

	₹	₹	₹	₹
Standard Profit				29,100
(Actual Quantity x Budgeted Margin)				
Effect of Variances				
Material Cost Variances:				
Material Price Variance		(600)		
Material Usage Variance		500	(100)	
Labour Cost Variances:				
Labour Rate Variance		200		
Labour Efficiency Variance (Rev.)		3,400		
Labour Idle Time Variance		(1,000)	2,600	
Variable Overhead Cost Variances:				
Variable Overhead Expenditure Variance		(50)		
Variable Overhead Efficiency Variance (Rev.)		510		
Variable Overhead Idle Time Variance		(150)	310	
Fixed Overhead Cost Variances:				
Fixed Variable Overhead Expenditure Variance		(4,560)		
Fixed Overhead Capacity Variance	(6,290)			
Fixed Overhead Idle Time Variance	(1,850)			
Fixed Overhead Efficiency Variance (Rev.)	6,290	(1,850)	(6,410)	
Sales Margin Variance:				
Sales Margin Price Variance		(1,400)		
Sales Margin Volume Variance		NA	(1,400)	(5,000)
Actual Profit				24,100

Adverse shown by (–) symbol

3. Working Notes:

1. Production Budget (Units)

Particulars	A	B
Sales	24,000	15,000
Add : Closing Stock	6,600	3,000
Total	30,600	18,000
Less : Opening Stock	600	6,000
Production	30,000	12,000

2. Direct Material Cost

Particulars	A (₹)	B (₹)	Total (₹)
Material X @ ₹ 3 per Kg.	6	12	
Material Y @ ₹ 1 per Kg.	1	2	
Material Cost (per unit)…(a)	7	14	
Production (units)…(b)	30,000	12,000	
Direct Material Cost (₹)…(a) x (b)	2,10,000	1,68,000	3,78,000

3. Direct Labour Cost

Particulars	A (₹)	B (₹)	Total (₹)
Dept. P : 2 hr @ ₹ 1 per hr. for A	2		
1 hr. @ ₹ 2 per hr. for B		2	
Dept. Q : 1 hr. @ ₹ 3 per hr. for A	3		
1 hr. @ ₹ 3 per hr. for B		3	
Direct Labour Cost (per unit)…(a)	5	5	
Production (units)…(b)	30,000	12,000	
Direct Labour Cost (₹)…(a) x (b)	1,50,000	60,000	2,10,000

4. Direct Labour Hours

Particulars	Dept. P	Dept. Q
A: P 30,000 × 2 hrs Q 30,000 × 1 hr.	60,000	30,000
B: P 12,000 × 1 hrs Q 12,000 × 1 hr.	12,000	12,000
	72,000	42,000

5. Overhead Recovery Rate

Particulars	Dept. P	Dept. Q
Fixed Overheads:	(₹)	(₹)
Depreciation	48,000	12,000
Others	96,000	30,000
Total	1,44,000	42,000
Direct Labour Hours	72,000	42,000
Fixed Overhead (rate per hr.) …(a)	2.00	1.00
Variable Overhead (rate per hr.)…(b)	0.50	1.50
Total Overhead (rate per hr.) ..(a)+(b)	2.50	2.50

6. Overhead Expenses

Particulars	Dept P (₹)	Dept Q (₹)	Total (₹)
Fixed (other than Depreciation)	96,000	30,000	
Variable [72,000 hr × ₹ 0.50; 42,000 hr × ₹ 1.50]	36,000	63,000	
Total Overheads (other than Depreciation) (a)	1,32,000	93,000	225,000
Depreciation (b)	48,000	12,000	60,000
Total Overheads (a) + (b)	1,80,000	1,05,000	285,000

7. Cost Sheet

Particulars	Products		
	A (₹)	B (₹)	Total (₹)
Direct Material (per unit)	7.00	14.00	
Direct Wages (per unit)	5.00	5.00	
Overhead (per unit) [Dept. P]	5.00	2.50	
[Dept. Q]	2.50	2.50	
Total Cost (per unit)..(a)	19.50	24.00	
Production…(b)	30,000	12,000	
Total Cost…(a) x (b)	5,85,000	2,88,000	8,73,000

8. Sales

Particulars		(₹)
A	24,000 units × ₹ 30	7,20,000
B	15,000 units × ₹ 40	6,00,000
	Total	13,20,000

9. Trade Receivables

Particulars	(₹)
Opening Balance	90,000
Add: Sales	13,20,000
Total	14,10,000
Less: Closing Balance	1,50,000
Cash Receipts	12,60,000

10. Raw Material

Particulars	Material		Total
	X (Kg.)	Y (Kg.)	(₹)
Consumption for 'A'	60,000	30,000	
Consumption for 'B'	48,000	24,000	
Total Consumption	1,08,000	54,000	
Add: Closing Stock	48,000	12,000	
Total	1,56,000	66,000	
Less: Opening Stock	36,000	6,000	
Material to be Purchase	1,20,000	60,000	
Purchase Price per Kg.	₹ 3	₹ 1	
Purchase Value (₹)	3,60,000	60,000	4,20,000

11. Trade Payables

Particulars	(₹)
Opening Balance	48,000
Add: Purchases	4,20,000
Total	4,68,000
Less: Closing Balance	48,000
Paid	4,20,000

12. Inventories as on 31-03-2013

Particulars	(₹)
Raw Material : 'X' 48,000 units × ₹ 3 = ₹1,44,000 'Y' 12,000 units × ₹ 1 = ₹12,000	1,56,000
Finished Goods : 'A' 6,600 × ₹ 19.50 = ₹1,28,700 'B' 3,000 × ₹ 24.00 = ₹72,000	2,00,700

13. Fixed Assets as at 31.03.2013

Particulars	(₹)
Opening Values of Fixed Assets	9,00,000
Add: Additions	1,20,000
Less: Depreciation	60,000
	9,60,000

Computation of Requirements of Question

(a) Cost of Goods Sold Budget

Particulars	(₹)
Direct Materials (Note 2)	3,78,000
Direct Wages (Note 3)	2,10,000
Overheads (Note 6)	2,85,000
Total	8,73,000
Add : Op. Stock (Balance Sheet)	2,40,000
Total	11,13,000
Less: Closing Stock (Note 12)	2,00,700
Cost of Goods sold	9,12,300

(b) Cash Budget

Particulars	(₹)
Opening Balance (Balance Sheet)	60,000
Receipts (Note 9)	12,60,000
Total Receipts (A)	13,20,000
Payments :	
Creditors (Note 11)	4,20,000
Direct Wages (Note 3)	2,10,000
Overheads (Note 6)	2,25,000
Selling, Distribution and Administration Expenses	1,80,900

Income Tax	60,000
Capital Expenditure	1,20,000
Total Payments (B)	12,15,900
Closing Balance (A) – (B)	1,04,100

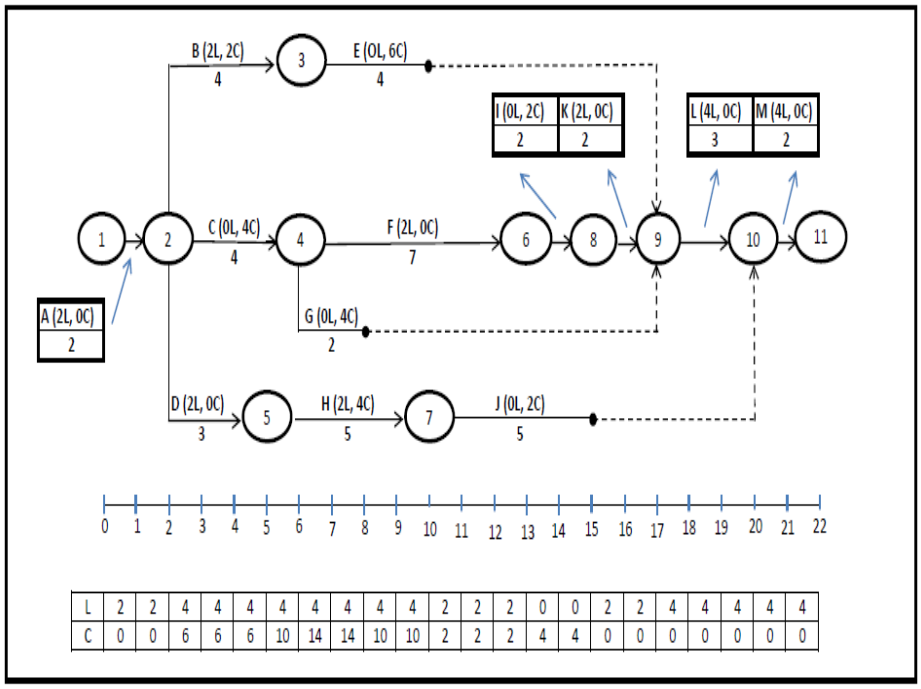
(c) Projected Balance Sheet as at March, 31, 2013

Equity and Liabilities	(₹)
Shareholder's Funds	
Share Capital	12,00,000
Reserve and Surplus*	2,54,760
Current Liabilities	
Trade Payables	48,000
Short-term Provisions	
Provision for Income Tax	68,040
	15,70,800
Assets	**(₹)**
Non-Current Assets	
Fixed Assets (Net)	9,60,000
Current Assets	
Inventories	3,56,700
Trade Receivables	1,50,000
Cash and Cash Equivalents	1,04,100
	15,70,800

* Reserve & Surplus

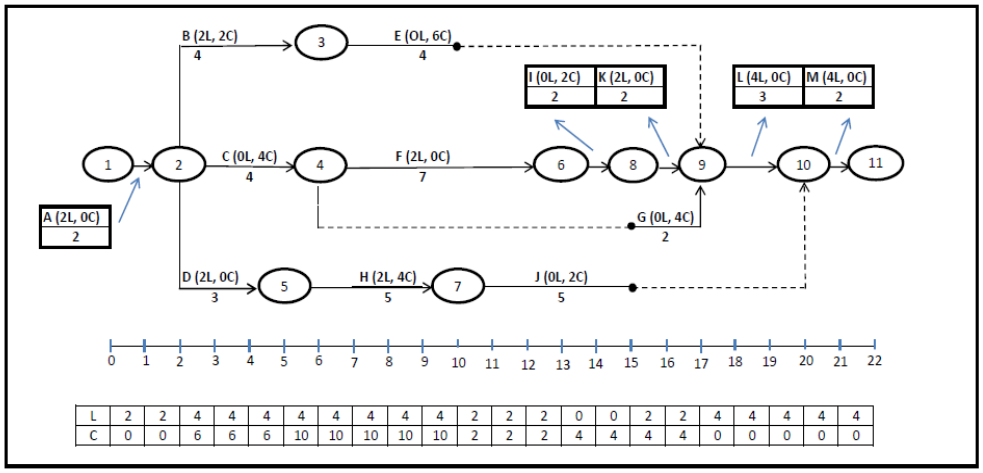
Particulars	(₹)
Sales (Note 8)	13,20,000
Less: Cost of Goods Sold	9,12,300
Gross Profit	4,07,700
Less : Selling Dist. & Admn. Expenses	1,80,900
Profit before tax	2,26,800
Less Provisions for tax (30%)	68,040
Profit after tax	1,58,760
Add : Opening Balance of Reserve & Surplus	96,000
Closing Balance of Reserve Surplus	2,54,760

4. It can be seen from below given resource accumulation table and the time-scaled version of the project that the demand on the resources is not even. On the 7th and 8th days the demand for carpenters is as high as 14, whereas on the 11th, 12th and 13th days it is two only. If the carpenters and labourers are to be hired for the entire project duration of 22 days, then during most of the days they will be idle and the company will have to hire at least L 14 carpenters and 4 laboures



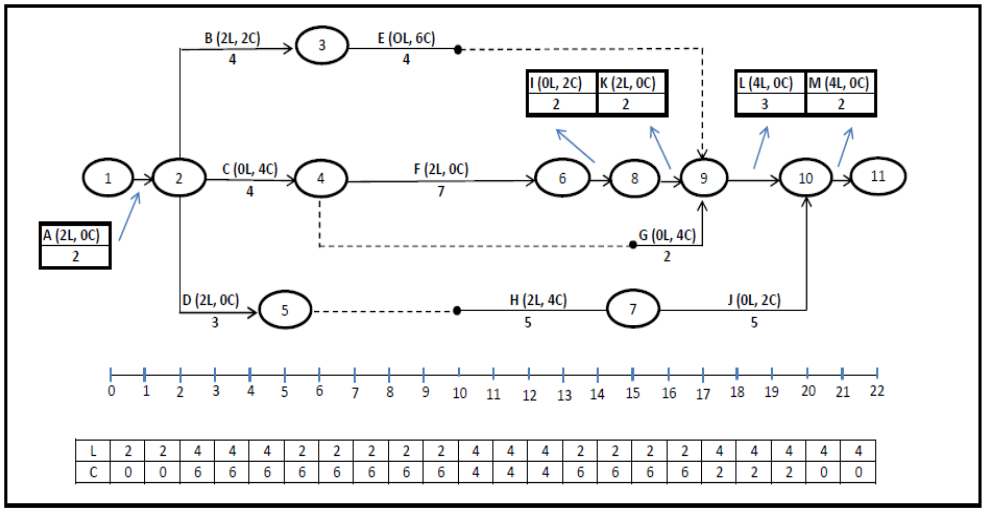
L	2	2	4	4	4	4	4	4	4	4	2	2	2	0	0	2	2	4	4	4	4	4
C	0	0	6	6	6	10	14	14	10	10	2	2	2	4	4	0	0	0	0	0	0	0

Re-Scheduling of Activities: As mentioned above the maximum demand on the resources occurs on the 6th, 7th, 8th, 9th and 10th days. The activities on these days will have to be shifted depending upon their floats such that the demand comes down. As can be seen from the above time-scaled version, activity 4-9 has maximum float, therefore we will try to shift activity 4-9 so that is starts on the 16th day instead of the 7th day. This reduces the demand on the carpenters from 14 to 10 on the 7th and 8th days so that the maximum demand for the carpenters on any day is now 10 and not 14. The modified resource accumulation table and the time-scaled version of the project is shown below.



It is evident from the above figure that the maximum demand now is for 10 carpenters on the 6th, 7th, 8th, 9th and 10th days.

Further smoothing of the resources is possible as activities 2–5, 5–7 and 7–10 have a total float of 5 days. The resultant time-scaled network and the resource accumulation table are given below.



As can be seen from the above figure the requirement for labourers is 4 and the requirement for carpenters reduces to 6 as against 14 carpenters originally estimated. Hence, by judiciously utilizing the float, we can smooth the demand on the resources.

5. Statement showing evaluation of alternatives

	Alternative One	Alternative Two	Alternative Three
Manufacture of Bottles	'WYE' Ltd	'WYE' Ltd	'EXE' Ltd
Storage of Product	'WYE' Ltd	'EXE' Ltd	'WYE' Ltd
Cash Inflows (including avoidable cost):			
Direct Materials other than 'P-6' (W.N.1)	3,75,000	3,37,500	37,500
Direct Labour (W.N. 4)	3,75,000	18,750	-
Rent of a part of Warehouse (W.N. 6)	67,500	-	-
Maintenance of Machine (W.N. 7)	27,000	27,000	-
Miscellaneous Overhead (W.N. 8)	1,18,125	94,500	23,625
Total Cash Inflows p.a. (A)	9,62,625	4,77,750	61,125
Cash Outflows:			
Contract Fee to 'WYE' Ltd.			
For Manufacture	9,37,500	9,37,500	-
For Packing and Storage	1,87,500	-	1,87,500
Total Outflow p.a. (B)	11,25,000	9,37,500	1,87,500
Net Cash Outflow p.a. (C) = (A-B)	1,62,375	4,59,750	1,26,375
Cash Outflows for 4 years (C) x 4	6,49,500	18,39,000	5,05,500
One Time Income/Inflow:			
Sale of 'P-6' (W.N. 3)	(4,80,000)	(4,32,000)	(48,000)
Sale of Machine (W.N. 5)	(1,87,500)	(1,87,500)	-
Net Cash Outflow	(18,000)	12,19,500	4,57,500

Therefore it is in the interest of 'EXE' Ltd. to shut down Division 'KXB'.

Working Note

(1) Direct Material other than 'P-6':

Direct material including 'P-6'	₹5,25,000
Use of 'P-6' 1/5th of ₹7,50,000	₹1,50,000
	₹3,75,000

Alternative One:

The material will be avoidable cost if Division 'KXB' is closed down.

Alternative Two:

Savings: ₹ 3,75,000-₹ 37,500=₹ 3,37,500 if manufacture is given to 'WYE' Ltd. and storage remains with 'EXE' Ltd.

Alternative Three:

Savings: ₹ 3,75,000-(90% of ₹ 3,75,000)= ₹ 37,500 if manufacture is done by 'EXE' Ltd. and storage given to 'WYE' Ltd.

(2) 'P-6' –Stock:

Stock in 2011	₹7,50,000
Used last year (1/5th)	₹1,50,000
Balance Stock	₹6,00,000

It is given that original price is ₹3,750

Therefore, ₹6,00,000/₹3,750=160 tonnes 'P-6' is there.

(3) 'P-6' –Value:

Alternative One:

Manufacturing and Storage is done by 'WYE' Ltd. Therefore it will be sold at ₹3,000 per tonne.

Cash inflow will be ₹3,000 x 160 =₹4,80,000

Alternative Two:

10% of all material will be used. It means 90% of 160 tonne will be sold.

Cash inflow will be 160x0.90x₹3,000=₹4,32,000

Alternative Three:

In this situation storage is done by 'WYE' Ltd. Therefore only 10% of whole quantity of 160 tonnes will be sold in market at ₹3,000 per tonne.

Cash inflow will be 16x₹3,000=₹48,000

(4) Direct Labour Cost:

Alternative One:

Avoidable Cost, if Deptt. KXB is closed (saving) ₹3,75,000

Alternative Two:

If manufacturing is given to 'WYE' Ltd. and 'EXE' Ltd. continues to store the product, saving on account of labour retrenchment will be only ₹18,750.

Alternative Three:

If manufacturing is done by 'EXE' Ltd. then labour force will continue. It means impact of labour cost in third alternative will be nil.

(5) Machine:

Machine is used for manufacturing of bottles. It is not required in alternative one and two. Therefore, it will be sold and there will be one time cash inflow of ₹1,87,500 under alternative one and two.

(6) Rent of Warehouse:

The hire charges of warehouse is ₹67,500 per annum. The remaining space of the warehouse is idle. It means, when department 'KXB' is closed, cash outflow of ₹67,500 will be avoided. Therefore, cashflow for alternatives two and three will not be disturbed on this account.

(7) Maintenance of Machine:

Maintenance of machine is required for manufacturing. It means ₹27,000 will be avoidable cost for alternative one and two. In third alternative this cost will continue to be there.

(8) Miscellaneous Overhead:

Miscellaneous overhead of ₹1,18,125 will be avoidable cost for alternative one. For second alternative 80% of this i.e. ₹94,500 will be avoidable cost. For third alternative 20% of ₹1,18,125 i.e. ₹23,625 will be avoidable cost.

(9) Supervisory Staff:

Supervisory staff will be transferred to another department in the first alternative. It means cash flow will not be affected. In the second and third alternatives, supervisory staff will be retained and it means no additional cash flow or relevant cost due to decision.

(10) Depreciation:

Depreciation does not affect the cash flow. Therefore it is not relevant for these decisions.

6. (i) (1) Total number of patients attended

Number of patients attended per day by a physician	20
Number of physicians employed	8
Number of days in week	6
Number of weeks in a year	52
Total number of patients attended = $20 \times 8 \times 6 \times 52 = 49,920$	

(2) Patient Mix:

Adults (50%)	49,920 × 50/100	=	24,960
Children (40%)	49,920 × 40/100	=	19,968
Senior Citizens (10%)	49,920 × 10/100	=	4,992
			49,920

(3) Patient Appointments:

No treatment required (60%)	49,920 × 60/100	=	29,952
Minor treatment (30%)	49,920 × 30/100	=	14,976
Major treatment (10%)	49,920 × 10/100	=	4,992
			49,920

(4) Income from Insurance Companies:

	Number of patients	(₹)	(₹)
	(A)	(B)	(A × B)
No treatment patients	29,952	30	8,98,560
Minor treatment patients	14,976	125	18,72,000
Major treatment patients	4,992	250	12,48,000
	Total		40,18,560

(5) Co-payment from adult patients:

Total number of adult patients 24,960

	Number of patients	Payment (₹)	Total payment (₹)
No treatment patients (60%)	14,976	30	4,49,280
Minor treatment (30%)	7,488	125	9,36,000
Major treatment (10%)	2,496	250	6,24,000
Total			20,09,280

(6) Net income:

	(₹)	(₹)
Payment from Insurance companies		40,18,560
Co-payment from adult patients		20,09,280
Total		60,27,840

Other Income (fixed)		2,40,000
Total Income (A)		62,67,840
Variable expenses:		
Material and consumables		11,16,000
Fixed expenses:		
Physician's salary (8 × ₹ 2,25,000)	18,00,000	
Assistants salary (8 × ₹ 75,000)	6,00,000	
Administrative staff's salary (2 × ₹45,000)	90,000	
Establishment and other operating costs	5,00,000	29,90,000
Total Expenditure (B)		41,06,000
Net Income (A – B)		21,61,840

(ii) 1. Contribution Analysis:

	(₹)
Total Fees from Insurance Companies and adult patients	60,27,840
Less: Variable costs	11,16,000
Contribution	49,11,840
Average contribution per patient (₹ 49,11,840/49,920)	98.39

2. Break-even patients:

	(₹)
Fixed costs	29,90,000
Less: Fixed income	2,40,000
Net Fixed costs	27,50,000
Break-even patients = $\frac{\text{Net fixed costs}}{\text{Contribution per patient}}$ = $\frac{27,50,00}{98.39}$ = ₹ 27,950	

3. Percentage of maximum capacity required to be utilized in order to break-even

Present utilization = $\frac{20 \text{ patients}}{24 \text{ patients}}$ =83.33%

100% patient capacity is $\frac{49,920}{83.33\%}$ =59, 906 patients

Percentage of maximum capacity required to be utilized in order to break-even

$$\frac{\text{Break}-\text{even patients}}{\text{patients capacity}} \times 100 = \frac{27,950}{59,906} \times 100 = 46.67\% \text{ say } 47\%$$

Assumption: Patient mix and mix of patient appointments will be same in the next year.

7. Statement showing the selling price of a Super Computer in India

	₹
A. Landed cost of a dismantled kit (Refer to working note 4)	81,340
B. Cost of local procurement (Refer to working note 3)	67,320
C. Cost of assembly and other overheads per computer	8,000
D. Total cost of manufacture: (A+ B + C)	1,56,660
E. Technology fee per computer (₹ 8,00,00,000 / 8,00,000 computer)	100
F. Royalty payment per unit (Refer to working note 6)	9,251
G. Total cost (D + E+ F)	166,011
H. Profit (20% on selling price of 25% of total cost)	41,503
I. Selling price (per computer)	207,514

Working Notes:

1. FOB price of dismantled kit:

   FOB price of dismantled kit (in$) 2,040

   FOB price of dismantled kit (in ₹) 1,12,200

   ($2,040 × ₹55)

2. Cost of a dismantled kit to Comp Inc.:

   It is given that quoted price on kits includes a 25% margin on profits.

   Cost of dismantled kit to Comp Inc. (100/125 x ₹1,12,200) = ₹ 89,760

3. Cost of local procurements:

   150% of the supplies made by Comp Inc. or 150% × ₹89,760 x 50% = ₹67,320

   *Being 50% of cost of a dismantled kit to Comp Inc.

4. Landed cost of a dismantled kit:

	₹
FOB price (50% × ₹1,12,200) (Refer to working note 1)	56,100
Add: Insurance & freight	2,000
CIF price	58,100
Add: Customs duty (40% × ₹58,100)	23,240
Landed cost of a dismantled kit	81,340

5. Cost of the standard items procured locally:

50% of the cost of locally procured goods

= 50% × ₹67, 320= ₹33, 660

6. Royalty payment per computer:

Let X = Selling price per unit of Super Computer

Y = Royalty paid per Computer

Since 20% is the margin of profit on S.P. it main a margin of 25% on C.P.

Therefore we have

X = 1.25 (₹ 81,340+₹ 67,320+₹ 8,000+ ₹ 100 + Y)

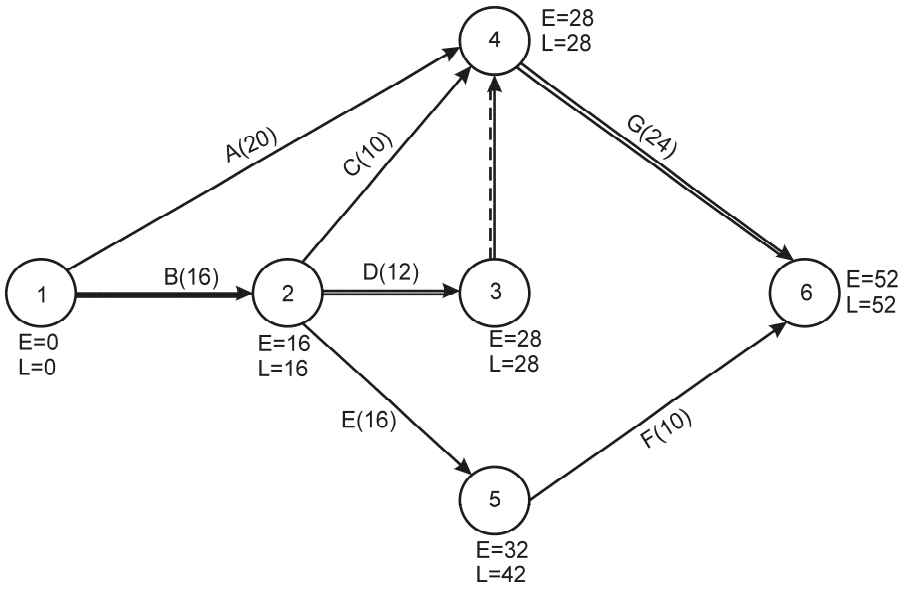
Y = 10% {X – (₹ 33,660 + ₹ 81,340)}

On solving the above equations we get:

X = ₹ 2,07,514 (Approx)

Y = ₹ 9,251(Approx)

8. (a)



Path 1-2-3-4-6 is critical path.

(b) Project duration is 52 weeks.

(c) Total cost of the project = Total Direct Cost + Indirect Cost

= ₹ 40,000 + ₹ 30,000 + ₹ 16,000 + ₹ 22,000 + ₹ 18,000 + ₹ 10,000 + ₹ 6,000 + (₹ 800 × 7 × 52)

= ₹1,42,000 + ₹2,91,200

= ₹ 4,33,200

(d)

Activity	Normal Duration (Weeks)	Crash duration (Weeks)	Normal cost (₹'000)	Crash Cost (₹'000)	Cost Slope (₹'000)
A (1-4)	20	14	40	60	$\frac{60-40}{20-14}$ = 3.33
B (1-2)	16	12	30	40	$\frac{40-30}{16-12}$ = 2.5

C (2-4)	10	8	16	28	$\frac{28-16}{10-8} = 6$
D (2-3)	12	8	22	30	$\frac{30-22}{12-8} = 2$
E (2-5)	16	10	18	30	$\frac{30-18}{16-10} = 2$
F (5-6)	10	8	10	16	$\frac{16-10}{10-8} = 3$
G (4-6)	24	16	6	8	$\frac{8-6}{24-16} = 0.25$

9. Working Note:

(1) Statement showing variable cost per 200-unit lot:

	₹	₹
Cushioned material:		
Padding	9.60	
Vinyl	16.00	
Total cushion material	25.60	
Cost increase 20%	05.12	
Cost of cushioned seat		30.72
Cushion fabrication labour: (₹30x0.5)		15.00
Variable overhead (Refer W.N.2) (₹20.00x0.5)		10.00
Variable cost per cushioned seat		55.72
Total variable cost per 200-unit lot		11,144

(2) Statement showing fixed overhead & variable overhead rate per direct labour hour:

	Variable Amount		Fixed Amount	
	₹	₹	₹	₹
	Total	Per DLH	Total	Per DLH
Indirect Material	16,80,000	5.60	-	-
Indirect Labour	15,00,000	5.00	-	-

Supervision	-	-	10,00,000	3.33
Power	7,20,000	2.40	-	-
Heat and light	-	-	5,60,000	1.87
Miscellaneous overheads	-	-	8,00,000	2.67
Depreciation	-	-	68,00,000	22.67
Employee Benefits:				
20% direct labour	18,00,000	6.00	-	-
20% supervision	-	-	200,000	0.66
20% indirect labour	3,00,000	1.00	-	-
	60,00,000	20.00	93,60,000	31.20

Variable overhead rate= ₹60,00,000/3,00,000=₹20.00/DLH

Fixed overhead rate=₹93,60,000/3,00,000=₹31.20/DLH

(3) Statement showing lost contribution margin from outside sales:

	Stylish Stool		Normal Stool
	₹		₹
Selling Price	225.00		160.00
Costs:			
Material	58.20		63.04
Labour (₹ 30.00x1.5)	45.00	(₹30.00x0.8)	24.00
Variable overhead (₹ 20.00x1.5)	30.00	(₹20.00x0.8)	16.00
Total Costs	133.20		103.04
Contribution margin per unit	91.80		56.96
Units produced	200		250 (Refer W.N.4)
	₹18,360		₹14,240

Amount of contribution margin lost as a result of shifting production to the normal stool (₹18,360 - ₹14,240) i.e. ₹ 4,120

(4) Number of economy office stools that can be produced:

Labour hours to make a 200-unit lot of stylish stools 1.50x200	300 Hrs
Less:Labour hours to make a 200-unit lot of cushioned seats 0.50x200	100 Hrs
Labour hours available for normal stool	200Hrs

Labour hours required to make one normal stool	0.8 hours/stools
Use of extra labour devoted to normal stool production (200/0.8)	250 stools

Since the 'FQR' Division is operating at full capacity, the transfer price must consider the division's variable costs of manufacturing the seat plus the lost contribution margin that will result from losing outside sales. Thus, the transfer price (Refer W.N.1 & 3)

=₹ 11,144 + ₹ 4,120 = ₹15,264

10 The usual learning curve model is

$y = ax^b$

y= Average Time per part for x parts

a = Time Required for first part=100 minutes

x = Cumulative number of parts

b = Learning coefficient and is equal to -0.322 (learning rate 80%)

Calculation of total time for 40 parts:

$y= 100 \times (40)^{-0.322}$

log y = log100-0.322 log40

log y = log100-0.322 [3log2+log5]

log y=2-0.322[3x0.30103+0.69897]

log y=1.484

y=antilog of 1.484

y=30.48 minutes

Total time for 40 Parts=40x30.48=1,219 minutes (A)

Calculation of total time for 60 parts:

$y= 100 \times (60)^{-0.322}$

log y = log100-0.322 log60

log y = log100-0.322 [2log2+log5+log3]

log y=2-0.322[2x0.30103+0.69897+0.47712]

log y=1.4274

y=Antilog of 1.4274

y=26.75 minutes

Total Time for 60 Parts=60x26.75=1,605 minutes (B)

The time required for parts 41 to 60 (B)-(A) =1,605-1,219=386 minutes

11. (a) Calculation of Probability

Supply			Demand		
Availability (kg)	No. of days	Probability	Demand (kg)	No. of days	Probability
5	20	20/(50x5)=0.08	5	25	25/(50x5)=0.10
10	25	25/(50x5)=0.10	10	55	55/(50x5)=0.22
15	95	95/(50x5)=0.38	15	100	100/(50x5)=0.40
20	75	75/(50x5)= 0.30	20	50	50/(50x5)=0.20
25	35	35/(50x5)=0.14	25	20	20/(50x5)=0.08

The demand and supply patterns yield the following probability distribution. The numbers 00-99 are allocated in proportion to the probabilities associated with each event.

Availability (kg)	Prob.	Cum. Prob. Allocated	Random Numbers	Demand (kg.)	Prob.	Cum Prob. Allocated	Random numbers
5	0.08	0.08	00-07	5	0.10	0.10	00-09
10	0.10	0.18	08-17	10	0.22	0.32	10-31
15	0.38	0.56	18-55	15	0.40	0.72	32-71
20	0.30	0.86	56-85	20	0.20	0.92	72-91
25	0.14	1.00	86-99	25	0.08	1.00	92-99

Let us simulate the supply and demand for the next five days using the given random numbers in order to find the profit if the cost of the commodity is ₹20 per kg, the selling price is ₹30 per kg, loss on any unsatisfied demand is ₹8 per kg and unsold commodities at the end of the day have no saleable value.

Day	Random No	Supply Availability	Random No.	Demand	Units bought & sold	Short supply	Excess supply	Net Profit
1	32	15	20	10	10	-	5	₹0 (10x₹10-5x₹20)
2	65	20	85	20	20	-	-	₹200 (20x₹10)
3	17	10	35	15	10	5	-	₹60 (10x₹10-5x₹8)
4	07	5	33	15	5	10	-	-₹30

5	45	15	80	20	15	5	-	(5x₹10-10X₹8) 110 (15X₹10-5X₹8)

Profit per Kg is ₹ 10 (₹ 30- ₹20)

Loss on any unsatisfied demand is ₹8 per kg

Cost of commodity (remains at the end of the day, has no saleable value) is ₹20

During the simulated period of five days, the net profit of the retailer is

=₹0+₹200 +₹60 + ₹110– ₹30 = ₹340

12. Let us first assume that the crew is based at Kolkata. The flight KX1, which starts from Kolkata at 05:15 A.M, reaches Bangkok at 07:15 AM. The schedule time for the flight at Bangkok is 07:15 AM. Since the minimum layover time for crew is 5 hours, this flight can depart only on the next day i.e. the layover time will be 24 hours. Similarly, layover times for other flights are also calculated and given in the following table.

Crew based at Kolkata

Flight No.	BX1	BX2	BX3	BX4
KX1	24	25	6	11
KX2	22	23	28	9
KX3	16	17	22	27
KX4	10	11	16	21

The layover times for various flight connections when crew is assumed to be based at Bangkok are similarly calculated in the following table.

Crew based at Bangkok

Flight No.	BX1	BX2	BX3	BX4
KX1	20	19	14	9
KX2	22	21	16	11
KX3	28	27	22	17
KX4	10	9	28	23

Now since the crew can be based at either of the laces, minimum layover times can be obtained for different flight numbers by selecting the corresponding lower value out of the above two tables. The resulting table is as given below:

Flight No.	BX1	BX2	BX3	BX4
KX1	20*	19*	6	9*
KX2	22*	21*	16*	9

KX3	16	17	22*	17*
KX4	10*	9*	16	21

(*) with an entry in the above table indicates that the corresponds to layover time when the crew is based at Bangkok.

Now we can apply the assignment algorithm to find the optimal solution. Subtracting the minimum element of each row from all the elements of that row, we get the following matrix.

Flight No.	BX1	BX2	BX3	BX4
KX1	~~14~~	~~13~~	~~0~~	~~3~~
KX2	~~13~~	~~12~~	~~7~~	~~0~~
KX3	~~0~~	~~1~~	~~6~~	~~1~~
KX4	~~1~~	~~0~~	~~7~~	~~12~~

Since there is a zero in each column, there is no need to perform column reduction. The minimum number of lines to cover all zeros is four which is equal to the order of the matrix. Hence, the above table will give the optimal solution. The assignment is made below:

Flight No.	BX1	BX2	BX3	BX4
KX1	14	13	[0]	3
KX2	13	12	7	[0]
KX3	[0]	1	6	1
KX4	1	[0]	7	12

The optimal assignment is

From Flight No.	To Flight No.	Layover
KX1	BX3	6
KX2	BX4	9
KX3	BX1	16
KX4	BX2*	9
		40 hours

13. Let

a = Personal Loan (in Lakhs ₹)

b = Credit Card Loan

c = Home Loan

d = Farm Loan

e = Commercial Loan

Total Interest = 0.135 x 0.91 x a + 0.145 x 0.88 x b + 0.115 x 0.98 x c
+ 0.120 x 0.96 x d + 0.105 x 0.99 x e

=0.1229a + 0.1276b + 0.1127c + 0.1152d + 0.1040e

Bad Debts = 0.09a + 0.12b + 0.02c + 0.04d + 0.01e

Maximize Z = Total Interest – Bad Debt

=0.1229a + 0.1276b + 0.1127c + 0.1152d + 0.1040e
– (0.09a + 0.12b + 0.02c + 0.04d + 0.01e)

=0.0329a + 0.0076b + 0.0927c + 0.0752d +0.094e

Total fund should not exceed ₹ 25 Lakhs:

$a + b + c + d + e \leq 25$

Farm and commercial loans equal at least 30% of all loans

$d + e \geq 0.30 \times (a + b + c + d + e)$

Or $0.30a + 0.30b + 0.30c - 0.70d - 0.70e \leq 0$

Home loans should equal at least 50% of personal, card and home loans

$c \geq 0.50 \times (a + b + c)$

Or $0.50a + 0.50b - 0.50c \leq 0$

Bad Debts should not exceed 5% of all loans:

$0.09a + 0.12b + 0.02c + 0.04d + 0.01e \leq 0.05 (a + b + c + d + e)$

Or $0.04a + 0.07b - 0.03c - 0.01d -0.04e \leq 0$

Maximize
$Z=0.0329a + 0.0076b + 0.0927c + 0.0752d +0.094e$

Subject to

$a + b + c + d + e \leq 25$

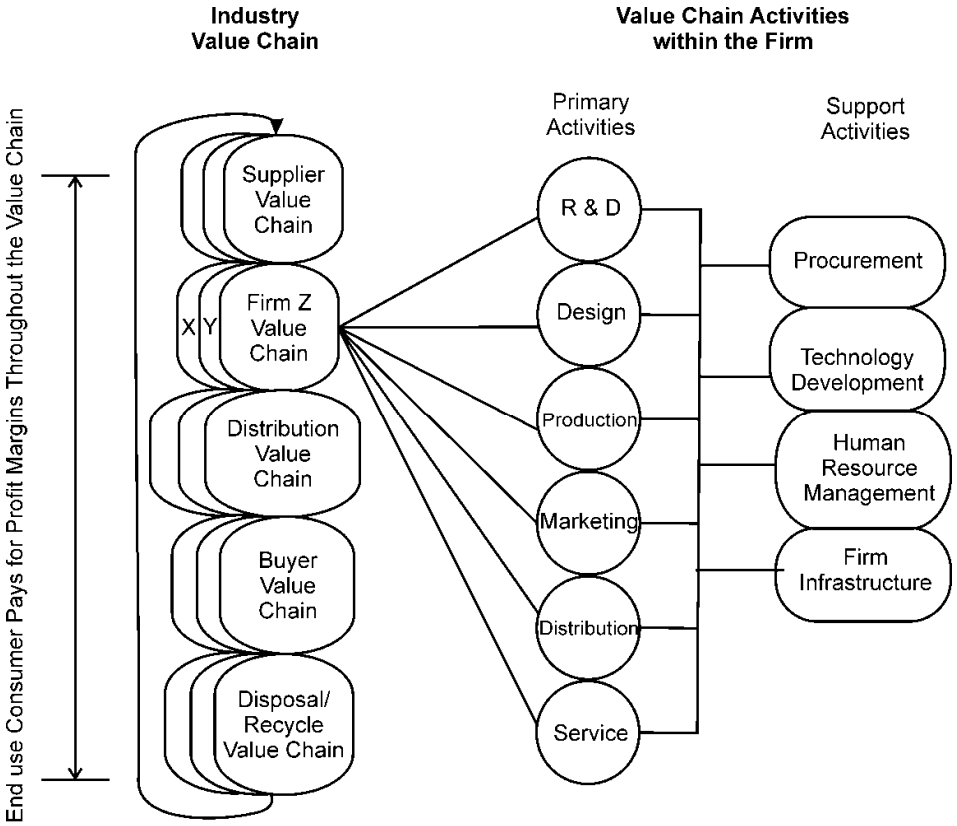
$0.30a + 0.30b + 0.30c - 0.70d - 0.70e \leq 0$

$0.50a + 0.50b - 0.50c \leq 0$

$0.04a + 0.07b - 0.03c - 0.01d -0.04e \leq 0$

$a, b, c, d, e \geq 0$

14.



15. Evaluation of Limiting factor:

Particulars	Material	Hours in Department A	Hours in Department B
Required :X	14,800 kgs.	3,700 hours	2,960 hours
Y	20,000 kgs.	3,000 hours	4,500 hours
Total Requirement	34,800 kgs.	6,700 hours	7,460 hours
Available resources	17,000 kgs.	3,400 hours	3,640 hours
Shortage	17,800 kgs.	3,300 hours	3,820 hours

Hence all the three resources are limiting factors.

Statement of Rank

Particulars	Product X	Product Y
Sales	90	80
Less: Direct Material	10	10
Dept. A	20	12
Dept. B	24	27
Contribution p.u.	36	31
Contribution per kg. of raw material	18	15.5
Rank	I	II
Contribution /hr. of Dept. A	72	103.33
Rank	II	I
Contribution /hr. of Dept. B	90	68.89
Rank	I	II

Formulation:

Let x_1 and x_2 donate quantities of product 'x' and product 'y' respectively.

$Z_{max} = 36x_1 + 31x_2$ – Total Fixed Cost

Subject to:

(i) For material, $2x_1 + 2x_2 \leq 17,000$

(ii) For Dept. A, $0.5x_1 + 0.3x_2 \leq 3,400$

(iii) For Dept. B, $0.4x_1 + 0.45x_2 \leq 3,640$

(iv) Demand constraint, $x_1 \leq 7,400$ and $x_2 \leq 10,000$

Statement showing product with higher contribution

Product	Maximum Demand (a)	Maximum Production by Dept A (b)	Maximum Production by Dept B (c)	Maximum Production with available materials (d)	Feasible Maximum production (lower of a, b, c and d)	Contrib-ution
X	7,400	6,800	9,100	8,500	6,800	2,44,800
Y	10,000	11,333	8,089	8,500	8,089	2,50,759

Therefore, Product Y should be produced at 8,089 units resulting in a contribution of ₹ 2,50,759.

16. (a) A value added activity is an activity that customers perceive as adding usefulness to the product or service they purchase. In other words, it is an activity that, if eliminated, will reduce the actual utility or usefulness which customers obtain from using the product or service. For example, painting a car in a company manufacturing cars or a computer manufacturing company making computers with preloaded software.

A non-value added activity is an activity where there is an opportunity of cost reduction without reducing the product's service potential to the customer. In other words, it is an activity that, if eliminated, will not reduce the actual or perceived value that customers obtain by using the product or service. For example, storage and moving of raw materials.

Value-added activities enhance the value of products and services in the eyes of the organisation's customers while meeting its own goals. Non-value added activities on the other hand do not contribute to customer-perceived value.

(b) Sunk cost is a historical cost incurred in the past. In other words it is a cost of a resource already acquired. Future decisions in respect of this resource will not be affected by it. For example, book value of machinery. Hence sunk costs are irrelevant in decision making.

Irrelevant costs are not necessary sunk costs. For example, when a comparison of two alternative production methods using the same material quantity is made, then direct material cost is not affected by the decision but this material cost is not sunk cost.

17. (a) Sensitivity analysis focuses on how a result will be changed if the original estimates or the underlying assumptions change.

Cost Volume Profit (CVP) – based sensitivity analysis can help mangers to provide answers to the following questions to cope with uncertainty.

What will be the profit if the sales mix changes from that originally predicted?

What will be the profit if fixed costs increase by 10% and variable costs decline by 5%?

The use of spreadsheet packages has enabled mangers to develop CVP computerised models which can answer the above questions. Managers can now consider alternative plans by keying the information into a computer, which can quickly show changes both graphically and numerically. Thus mangers can study various combinations of changes in selling prices, fixed costs, variable costs and product mix, and can react quickly without waiting for formal reports from the accountant. In this manner the use of CVP based sensitivity analysis can help mangers to cope up with uncertainty.

(b) It may be justifiable to sell at a price below marginal cost for a limited period under the following circumstances:

(i) Where materials are of perishable nature

(ii) Where stocks have been accumulated in large quantities and the market prices have fallen.

(iii) To popularize a new product

(iv) Where such reduction enables the firm to boost the sale of other products having larger profit margin.

(v) To capture foreign markets

(vi) To obviate shut down costs

(vii) To retain future market

18. (a) An ideal Balanced score card combines financial measures of past performance with measures of the firm's drivers of future performance. The following perspectives are evaluated:

(i) Customer perspective – Measures of price / delivery / quality / support.

(ii) Internal perspective – Measures of efficiency / sales penetration and new product introduction.

(iii) Innovation and learning perspective – Measures of technology / cost leadership.

(iv) Financial perspective – Sales / Cost of sales / Return on capital employed etc.

(b) Requisites for the installation of uniform costing: Essential requisites for the installation of uniform costing are as under:

(i) The firm's in the industry should be willing to share / furnish relevant data or information.

(ii) A spirit of cooperation and mutual trust should prevail among the participating firms.

(iii) Mutual exchange of ideas, methods used, special achievement made, research and know how etc. should be frequent.

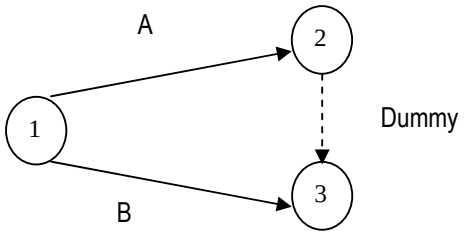
(iv) Bigger firms should take the lead towards sharing their experience and know how with the smaller firm to enable the latter to improve their performance.

(v) In case of accounting methods, principles, procedure and production method uniformity must be established.

19. (a) A transportation problem has m +n –1 basic variables which means that the number of occupied cells is such a solution is one less than the number of rows plus the

number of columns. It may happen sometimes that the number of occupied cells is less than m +n –1. Such a solution is called a degenerate solution.

(b) Dummy Activity is that activity which does not consume time or resources. It is used when two or more activities have same initial and terminal events. As a result of using dummy activities, other activities can be identified by unique end events. These are usually shown by arrows with dashed lines.



20. (a) CPM is a deterministic model i.e. It does not take into account the uncertainties involved in the estimation of time for execution of a job or an activity. It completely ignores the probabilistic element of the problem. PERT, however, is a probabilistic model. It uses three estimates of the activity time; optimistic, pessimistic and most likely; with a view to take into account time uncertainty. Thus, the expected duration of each activity is probabilistic and expected duration indicates that there is fifty per cent probability of getting the job done within that time.

(b) The given problem is a balanced minimization transportation problem. The objective of the company is to minimize the cost. Let us find the initial feasible solution using Vogel's Approximation method (VAM)

Depots \ Plants	CA	CB	CC	CD	Capacity	Difference
CX	6	8	6	5 1,200	1,200/0	1 1 1 1
CY	4 600	4 800	8	4 200	1,600/800/200/0	0 0 0 0
CZ	3 600	7	2 600	8	1,200/600/0	1 4 - -
Req	1,200/600/0	800/0	600/0	1,400/1,200/0		
Diff:	1 1 2 2	3 3 4 -	4 - - -	1 1 1 1		

Since the number of allocations = 6 i.e. (m+n-1), let us test the above solution for optimality.

(u_i+v_j) matrix for allocated cells

				u_i
			5	1
4	4		4	0
3		2		-1
v_j	4	4	3	4

(u_i+v_j) matrix for un allocated cells

				u_i
5	5	4		1
		3		0
	3		3	-1
v_j	4	4	3	4

$\Delta_{ij} = C_{ij} - (u_i+v_j)$

1	3	2	
		5	
	4		5

Since, all allocations are non negative, the allocation is optimal.

The optimal allocation are given below

Plants	Outlet	Units [A]	Cost'000 (₹)[B]	Total Cost'000 (₹) [C=(A) x(B)]
CX	CD	1,200	5	6,000
CY	CA	600	4	2,400
CY	CB	800	4	3,200
CY	CD	200	4	800
CZ	CA	600	3	1,800
CZ	CC	600	2	1,200
Total				15,400