FINAL EXAMINATION

GROUP III

(SYLLABUS 2016)

SUGGESTED ANSWERS TO QUESTIONS

DECEMBER 2018

Paper- 15: STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed: 3 Hours   Full Marks :100

The figures in the margin on the right side indicate full marks.

Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks.

Further, answer any 5(five) Questions from Section B, each carrying 16 marks

SECTION – A

(20 marks)

1. Choose the most appropriate answer to the following questions giving justification :

2x10=20

(i) A company has a break even point when sales are Rs. 3,20,000 and variable cost at that level of sales are Rs. 2,00,000. How much would contribution margin increase or decrease if variable expenses are dropped by Rs.30,000 ?.
   (A) Increase by 27.5%
   (B) Increase by 9.375%
   (C) Decrease by 9.375%
   (D) Increase by 37.5%

(ii) Twin Ltd. uses JIT and back flush accounting. It does not use a raw material stock control account. During September 2018, 10000 units were produced and sold. The standard cost per unit is Rs. 150 which includes materials of Rs. 60. During September 2018, Rs. 9,90,000 of conversion costs were incurred. The debit balance in cost of goods sold account for September 2018 was
   (A) Rs.14,00,000
   (B) Rs.14,80,000
   (C) Rs.15,90,000
   (D) Rs.16,20,000

(iii) A company operates a standard absorption costing system. The budgeted fixed production overheads for the company for last year were Rs. 3,30,000 and budgeted output was 220,000 units. At the end of the company's financial year, the total of the fixed production overheads debited to the Fixed Production Overhead Control Account was Rs. 2,60,000 and the actual output achieved was 2,00,000 units. The under/over absorption of overhead was
   (A) Rs. 40,000 over absorbed.
   (B) Rs. 40,000 under absorbed.
   (C) Rs. 50,000 over absorbed.
   (D) Rs. 50,000 under absorbed.

(iv) A company has the capacity of producing 80000 units and presently sells 20000 units

at Rs. 100 each. The demand is sensitive to selling price and it has been observed that with every reduction of Rs. 10 in selling price the demand is doubled. What should be the target cost in selling price if the demand is doubled at full capacity and profit margin on sale is taken at 25%?
(A) Rs.75
(B) Rs.90
(C) Rs.25
(D) Rs.60

(v) A factory can make only one of the three products X, Y or Z in a given production period. The following information are given :

Per unit Rs.	X	Y	Z
Selling Price	1500	1800	2000
Variable Cost	700	950	1000

Assume that there is no constraint on resource utilization or demand and similar resources are consumed by X,Y and Z. The opportunity cost of making one unit of Z is
(A) Rs. 850
(B) Rs. 800
(C) Rs. 1800
(D) Rs. 1500

(vi) AB company is a supermarket group that incurs the following costs :
(A) The bought-in price of the goods
(B) Inventory finance costs
(C) Self refilling costs
(D) Costs of repacking or 'pack out' prior to storage before sale

AB company's calculating of direct product profit (DPP) would include
(A) Costs (a) and (c) only.
(B) All of the above cost except (b)
(C) All of the above costs except (d)
(D) All of the above costs.

(vii) S Ltd. manufactures a product whose time for the first unit is 1000 hours. It experience a learning curve of 80%, What will be the total time taken in hours for unit 5 to 8 ?
(A) 4096 hours
(B) 3200 hours
(C) 1536 hours
(D) 2000 hours

(viii) H Group has two divisions, Division P and Division Q. Division P manufactures an item that is transferred to Division Q. The item has no external market and 6000 units produced are transferred internally each year. The costs of each division are as follows ?

	Division P	Division Q
Variable Cost	Rs. 100 per unit	Rs. 120 per unit
Fixed cost each year	Rs. 1,20,000	Rs. 90,000

Head Office management decided that a transfer price should be set that provides a profit of Rs. 30,000 to Division P. What should be the transfer price per unit ?
(A) Rs.145
(B) Rs. 125
(C) Rs. 120
(D) Rs. 135

(ix) In the context of Critical Path Analysis, the portion of the float of an activity which

cannot be consumed without affecting adversely the float of the subsequent activities is called

(A) Free float

(B) Interfering float

(C) Independent float

(D) Total float

(x) In CPA (Critical Path Analysis) which of the following is not a correct step in sequence?

(A) Understanding the logic of the system under consideration

(B) Constructing the net work

(C) Providing estimates for activity duration.

(D) Implementing and controlling the net work.

Answer: 1

(i) (b) S – V = C = Rs. 3,20,000 – 2,00,000 = Rs. 1,20,000

c/s ratio = $\frac{1,20,000}{3,20,000}$ x 100 = 37.5%

New VC = Rs. 1,70,000,

∴ C = Rs. 1,50,000

c/s ratio = $\frac{1,50,000}{3,20,000}$ x 100 = 46.875%

∴ % increase in c = 46.875 – 37.5% = 9.375%

(ii) (c)

	Rs.
Standard cost of goods sold	15,00,000
(10,000 units @ Rs.150)	
Less : Std. material cost	6,00,000
(10,000 @ Rs. 60)	9,00,000
Standard conversion cost	
Conversion cost incurred	9,90,000
Excess charged to cost of goods	-------------
sold a/c. (debit)	90,000

∴ Total debit balance of cost of goods sold

Account = Rs. 15,00,000 + 90,000 = Rs. 15,90,000

(iii) (a)

Overhead Absorption Rate = $\frac{Rs.3,30,000}{2,20,000\ units}$ = Rs.1.50/unit

Overhead Absorbed : 2,00,000 @ Rs. 1.50 = Rs. 3,00,000

Actual overhead   Rs. 2,60,000

Over absorbed overhead   Rs.   40,000

(iv) (d) as per following :

Demand	price (Rs.)
20,000	100
40,000	90
80,000	80

∴ Target cost = Rs. 80 – (25% of 80) = Rs. 60/-

(v) (a)

Opportunity cost is the cost of next best alternative foregone. Between X and Y, y has a better contribution i.e. Rs. 850 as against X (Rs. 1500 – 700) = Rs. 800.

(vi) (d) Because all of the costs mentioned can be identified with specific goods/product and would be deducted from the selling price to determine the direct product profit.

(vii) (c) as per the following :
At 80% Learning Curve, the total time for 8 units will be 8*512 i.e. 4096 hours and for 4 units it is 4*640 i.e. 2560 hours. Hence the time taken for units 5 to 8 will be 1536 (4096 – 2560)

(viii) (b) variable cost + (Fixed cost + Profit Desired) ÷ Volume = Rs. 100 + (1,20,000 + 30,000) ÷ 6000 = Rs. 125/-

(ix) (b) Interfering float is that part of the total float which causes a reduction in the float of the successor activities. It is the difference between the latest finish time of the activity in question and the earliest starting time of the following activity or zero, whichever is larger.

(x) (d) Because step no. 4 i.e. (d) should be satisfying the objectives. Implementing and controlling the network would be the final step.

SECTION – B

Answer any five question
Each Question carries 16 Marks

16 x 5 = 80

2. (a) You are given the following data for a period in respect of two products, X and Y, which consume support services in different proportions :

	Product X	Product Y
Unit produced	40	40
Material moves per product unit	12	28
Direct labour hrs. per unit	1740	1740

Budgeted material handling costs :Rs. 3,48,000

Required :
(i) Determine cost per unit of X and Y using the volume-based allocation method (direct labour hrs.)
(ii) Compute cost per unit of X and Y using ABC.
(iii) How would you explain the results ?   1+3+4=8

2. (b) The profit for The Forward Look Ltd. works out to 12.5% of the capital employed and the relevant figures are as under :

	Rs.
Sales	5,00,000
Direct Materials	2,50,000
Direct Labour	1,00,000
Variable Overheads	40,000
Capital employed	4,00,000

The new Sales Manager who has recently joined the Company estimates for the next year a profit of about 23% on the capital employed provided the volume of Sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.
Verify the contention of the Sales Manager by computing in detail the cost and profit for the next year and state whether his proposal can be adopted by the management.   8

Answer : 2(a)

(i)   Direct labour hour rate $= \dfrac{Budgeted\ overheads}{Budgeted\ direct\ abour\ hours}$

$= \dfrac{Rs.348,000}{(40\ X\ 1740 + 40\ X\ 1740)} = \dfrac{Rs.3,48,000}{1,39,200}$ = Rs. 2.5

	Product X	Product Y
Total direct labour hours taken	69,600	69,600
Labour rate	Rs. 2.5	Rs. 2.5
Material handling cost absorbed (hrs x Rate)	1,74,000	1,74,000
Units produced	40	40
Material handling cost per unit	4,350	4350

(ii)   Since number of material moves causes material handling costs, use of this cost driven gives a better result :

Rate per material move $= \dfrac{Rs\ 3,48,000}{12+28}$ = Rs. 8,700

	Product X	Product Y
Total Material moves	12	28
Material handling costs applied @ Rs. 8,700/-	Rs. 1,04,400	2,43,600
units produced	40	40
Material handling cost per unit	Rs. 2,610	6,090

(iii)   Product Y requires more material moves and hence shares nationally more material handling costs under (ii) above. In other words, the complexity or diversity of Product Y is taken care of when overhead costs are allocated to this product using appropriate cost driven under ABC.

Answer : 2(b)

Computation of Fixed Cost:

		Rs.
Annual Sales		5,00,000
Less Profit :Rs. 4,00,000 x 12.5%		50,000
Total Cost		4,50,000
Less Variable Cost : Direct Material	Rs. 2,50,000	
Direct Labour	Rs. 1,00,000	
Variable Overhead	Rs. 40,000	
		3,90,000
		60,000

Statement showing Profit obtained upon adopting the Sales Manager's proposal :

			Rs.
(i)	Revised Sales :	Rs. 5,00,000 x 110% x 104%	5,72,000
(ii)	Variable Cost :	Rs. 3,90,000 x 110% x 98%	4,20,420
(iii)	Contribution		1,51,580
(iv)	Fixed Cost	Rs. 60,000 x 98%	58,800
(v)	Profit		92,780

Percentage of Profit on Capital Employed = (Rs. 92,780 /4,00,000) × 100 = 23.195 > 23%

Conclusion : The Sales Manager's proposal can be adopted.

3. (a) XYZ Ltd. produces three products. The cost data are as under :

Particulars	X	Y	Z
Direct Materials Direct Labour :	Rs.64	Rs.152	Rs.117

Dept.	Rate per hour (Rs)	Hrs.	Hrs.	Hrs.
1	5	18	10	20
2	6	5	4	6.5
3	4	10	5	20
Variable overheads		Rs.16	Rs.9	Rs.24

Fixed overheads Rs. 4,00,000 per annum

The budget was prepared at a time, when market was sluggish. The budgeted quantities and selling prices are as under :

Product	Budged Quantity	Selling price (Rs.) unit
X	9750	270
Y	7800	280
Z	7800	400

Later the market improved and the sale quantities could be increased by 20% for product X and 25% each for products Y and Z. The Sales Manager confirmed that the increased quantities could be achieved at the prices originally budgeted. The Production Manager has stated that the output cannot be increased beyond the budgeted level due to limitation of direct labour hours in Department 2.

Required :
(i) Set optimal product mix.
(ii) State profit under optimal product mix. 6+6 = 12

(b) A company is producing and selling three products. How would you determine relative profitability of products in each of the following independent situation ?

(i) Total sales potential in unit is limited,

(ii) Total sales potential in value is limited,

(iii) Raw materials are in short supply,

(iv) Production capacity (machine hours) is limited.

1+1+1+1 = 4

Answer : 3(a)

Products :		X	Y	Z
Budged Quantity (units) :		9,750	7,800	7,800
Selling price (p.u.):	(i)	270	280	400
Variable cost (p.u.):				
Direct materials		64	152	117
Direct labour		160	94	219
Variable overheads		16	9	24
Total variable cost (p.u.)	(ii)	240	255	360

Contribution (p.u) (Rs.)	(i) – (ii)	30	25	40

Statement of optima product mix and profit.

Products :		X	Y	Z	Total
Contribution (p.u) : (Rs.)	(a)	30	25	40	
Direct labour hours in Dept.2	(b)	5	4	6.5	
Contribution per hr:	(a)/(b)	6	6.25	6.15	
Ranking		III	I	II	
Optimal product mix units	(c)	5655	9750	9750	
		(28275 hrs.)	(39000 hrs)	(63375 hrs)	
Total contribution (Rs.)	(a)x(c)	169650	243750	390000	803400
Less : Fixed cost (Rs.)					400000
Optimal profit					403400

Working Notes

(1) Total hours available in Department 2

Products (a)	Units (b)	Hrs.(p.u.) (c)	Total hrs. (d) = (b) x (c)
X	9,750	5	48,750
Y	7,800	4	31,200
Z	7,800	6.5	50,700
		Total available hrs. for budgeted production	1,30,650

(2) Maximum Sales Quantities of Products (under improved market conditions)

Products	Units	Increase in percentage	Total number of units
X	9,750	20	11,700
Y	7,800	25	9,750 x 4 = 39,000
Z	7,800	25	9,750x6.5=63,375

Required hours for Y+Z   1,02,375

Hours available for X : 1,30,650 – 1,02,375 = 28,275

∴ Production for X   28,275 ÷ 5 = 5655 units

Answer : 3(b)

The Section process will be based on optimization of contribution in relation to constraint.

(i) Unit contribution

(ii) P/V or C/S ratio

(iii) Contribution per Kg of RM

(iv) Contribution per machine hour.

4. a) **A company is organized into two divisions, namely X and Y, and produces three products A, B and C. Data per unit are :**

	A	B	C
Market price (Rs.)	240	230	200
Variable costs (Rs)	168	120	140
Direct Labour (hours)	4	5	3
Maximum sales potential (units)	1600	1000	600

Division Y has a demand for 600 units of product B for its use. If Division X cannot supply the requirement, Division Y can buy a similar product from market at Rs. 224 per unit.

Required :
What should be the transfer price of 600 units of B for Division Y, if the total direct labour-hours available in Division X are restricted to 15000 ?

8

Answer : 4(a)

		Product		
Particulars		**A**	**B**	**C**
Market price	(Rs.)	240	230	200
Less : Variable costs	(Rs.)	168	120	140
Contribution p.u	(i)	72	110	60
Direct labour hours p.u.	(ii)	4	5	3
Contribution per D.L.H.	(i)/(ii)	18	22	20
Rank		III	I	II

Production	Max. Sales	Hrs/Unit	Production	Hours used	Balance hours
A	1000	5	1000	5000	10000
B	600	3	600	1800	8200
C	1600	4	1600	6400	1800

Spare hours available in Division X = 1800 hrs

Division X can produce Product B in 1800 spare hours

= 1800 hrs/5 hrs. pu   = 360 units of product B

Balance units of Products B required by Division Y = 600 units – 360 units = 240 units

Labour hours required for 240 units of Product B = 240 units x 5 hrs. per unit = 1200 hours.

Opportunity contribution of A per hr.   = Rs. 18

Calculation of Minimum Transfer Price p.u.			Rs.
Variable cost		(600 units ×Rs. 120)	72000
Opportunity cost of contribution lost		(1200 hrs×Rs. 18)	21600
Amount to be recovered			93600
Transfer price p.u.	(Rs.)	(Rs. 93600 / 600 units)	156

(b) Prism Ltd. has decided to adopt JIT policy for materials. The following effects of JIT policy are identified :

    (i) **To implement JIT, the company has to modify its production and material receipt facilities at a capital cost of Rs. 2,00,000. The new machine will require a cash operating cost Rs. 2,16,000 p.a. The capital cost will be depreciated**

over 10 years.

(ii) Raw material stockholding will be reduced from Rs. 40,00,000 to Rs. 15,00,000.

(iii) The company can earn 12% on its long-term investments.

(iv) The company can avoid rental expenditure on storage facilities amounting to Rs. 66,000 per annum. Property Taxes and Insurance amounting to Rs. 44,000 will be saved due to JIT programme.

(v) Presently there are 7 workers in the Store department at a salary of Rs. 10,000 each per month. After implementing JIT scheme, only 4 workers will be required in this department. Balance 3 workers' employment will be terminated.

(vi) Due to receipt of smaller lots of Raw Materials, there will be some disruption of production. The costs of stockouts are estimated at Rs. 1,54,000 per annum.

(vii) Since the supplier is new having no reputation as yet in the market, an additional inspection cost of Rs. 12,000 p.a. has to be incurred.

Required :
Determine the financial impact of the JIT policy. Is it advisable for the company to implement JIT system ?   6+2= 8

Answer :4(b)

(b)   Cost-Benefit Analysis of JIT policy.

Costs	Rs.	Benefits	Rs.
Interest on capital for	24000	Interest on investment on released funds	300000
modifying production facilities (Rs. 2,00,000 x 12%)		(Rs. 40,00,000 – Rs. 15,00,000) x 12%	
Operating Costs of new production facilities	216000	Saving in salary of 3 workers terminated	360000
Depreciation of new production facilities	Nil	(Rs. 10,000 x 12 months x 3)	66000
		Saving in rental Expenditure	
Stock-Outs costs (given)	154000		44000
Inspection cost	12000	Saving in Property Tax & Insurance	
Net benefit due to JIT policy	364000		
Total	770000	Total	770000

Conclusion : The JIT policy may be implemented, as there is a Net Benefit of Rs. 82000 per annum.

Note : Depreciation, being apportionment of non-cash capital cost, is ignored in decision-making. Tax saving on Depreciation is not considered in the above analysis.

5. (a) One kilogram of product 'K' requires two chemical A and B. The following were the details of product 'K' for the month of June 2018 :
   (i) Standard mix ratio is 1:1

(ii) **Standard price per kilogram of chemical 'A' Rs. 12 and chemical 'B' Rs. 15.**

(iii) **Actual input of chemical 'B' 70 kilograms**

(iv) **Actual price per kilogram of Chemical 'A' Rs. 15**

(v) **Standard normal loss 10% of total input.**

(vi) **Materials cost variance total Rs. 650 adverse and the same was fully attributable to Chemical 'B'.**

(vii) **Materials yield variance total Rs. 135 adverse.**

Required :

Compute all missing variances and complete the Variance Report.   **6+4=10**

Answer : 5(a)

	SPSQ	SPRSQ	SPAQ	AQAP
A	12*?	12*?	12*?	?*15
B	15*?	15*?	15*70	70*?

1) Let the total actual input be X kgs. Therefore applying the Standard Mix Ratio, the Revised Standard Quantity of Chemicals A and B each would be 0.5 kgs.

2) Total YIELD VARIANCE of 135 adverse can be split according to the ratio of SPSQ. Since inputs are equal the ratio will be that of price i.e. 4:5. Hence YIELD VARIANCE of A is 60 Adverse and B is Rs. 75 Adverse. Substituting yield variance we get SQ of A & B each as 50 kgs.
   A = 12*(SQ – 0.5X) = -60   SQ-0.5X = .5   SQ=0.5X-5
   Similarly for B SQ= 0.5X-5

3) total actual input = X kgs. : Actual input of A = (X-70)
4) Material Cost Variance of A = Nil (i.e. SPSQ-AQAP)=0
   i.e., 12*(05.X-5) – 15*(X-70)
   Solving this X = 110

   Therefore, Revised Standard Quantity of A and B each is 55 kg and Standard Quantity of A and B each is 50 Kgs.

   Material cost variance of B = Rs. 650 Adverse
   i.e. (15*50) – 70*AP = -650 ∴ 750 – 70AP = -650, 70AP = 1400, AP = 20

The final variance report is as follows

	SPSQ	SPRSQ	SPAQ	AQAP
A	600	660	480	600
B	750	825	1050	1400
Total	1350	1485	1530	2000

	Yield	Mix Variance	Usage Variance	Price Variance	Cost Variance
A	60A	180F	120F	120A	0
B	75A	225A	300A	350A	650A
Total	135A	45A	180A	470A	650A

(b) For a machine the financial data are given below :

Time (Year)	0	1	2	3	4
Outlay (Rs)	5000				
Operating Costs (Rs)		1400	1500	1600	1700
Maintenance (Rs.)			300	400	500

Value if scrapped (Rs.)		3400	2000	800	600

The appropriate interest rate is 12% p.a. and the discount factor is as follows :

Year	0	1	2	3	4
12% Disc. Factor	1	0.893	0.797	0.712	0.636

Required :

Determine the optimal length of replacement cycle.   4+2=6

Answer : 5(b)

Year	0	1	2	3	4	Present Value	Annuity Factor	Average PV
12% Disc Factor	1	0.893	0.797	0.712	0.636			
1	-5000	2000				3214	0.893	3599
2	-5000	-1400	200			6091	1.69	3604
3	-5000	-1400	-1800	-1200		8539	2.402	3555
4	-5000	-1400	-1800	-2000	-1600	10126	3.038	3333

Decision: Better to replace at the end of year 4 as the average present value is the lowest.

6. (a) The following is the information regarding turnover and quality cost of a company.
    (i)   Sales revenue Rs. 10,000,000 ; net income Rs. 10,00,000
    (ii) During the year, customers returned 30000 units needing repair. Repair cost averages Rs. 7 per unit.
    (iii) Six inspector are employed, each earning an annual salary of Rs. 25,000. These six inspectors are involved only with final section (Production acceptance).
    (iv) Total scrap is 30000 units. All scrap is quality related. The cost of scrap is about Rs. 15 per unit.
    (v)   Each year, approximately 150000 units are rejected in final inspection. Of these units, 80 per cent can be recovered through rework. The cost of rework is Rs. 3.00 per unit.
    (vi) A customer cancelled an order that would have increased the profits by Rs. 2,50,000. The customer's reason for cancellation was poor product performance. The accounting and marketing departments agree that the company loses at least this much during the year for the same reason.
    (vii) The company employs five full time employees in its complaint department. Each earns Rs. 20,000 a year.
    (viii) The company gave sales allowances totaling Rs. 1,30,000 due to substandard products being sent to the customer.
    (ix) The company requires all new employees to take in three hour Quality-Training programme. The estimated cost for the programme is Rs. 80,000.
    (x)   Inspection of the final product requires testing equipmenet. The annual cost operating and manufacturing this equipment is Rs. 1,20,000.

    Required :

    Prepare a simple quality cost report classifying costs by rational category.   8

Answer : 6(a) Quality Cost Report

		Quality Costs	Percentage of sales
i)	Prevention costs		
	Quality training	80,000	0.8%

     ii) <u>Appraisal costs</u> :

Product inspection	150,000	
Test equipment	<u>120,000</u>	
	270,000	2.7%

     iii) <u>Internal failure costs</u> :

Scrap	450,000	
Rework	<u>360,000</u>	
	810,000	8.1%

     iv) <u>External failure costs</u> :

Repair	210,000	
Order cancellation	250,000	
Customer complaints	100,000	
Sales allowance	<u>130,000</u>	
	690,000	6.9%
Total quality costs (i to iv)	1,850,000	8.5%

(b) The following was the pattern for demand of cars rented out by a tourist operator observed for 100 days :

No. of cars	5	7	10	15
No. of days	20	30	40	10

The random numbers are 88, 76, 10, 05, 23

Required :

(i) Simulate the demand for cars over five days.

(ii) How many cars should the operator have in order to have at least 75% probability of fulfilling the demand based on your simulated results ?   **5+3=8**

Answer : 6(b)

No. of cars	No. of Days	Probability	Cumulative Prob	Random No. Interval	Day	Random No.	Demand
5	20	0.20	0.20	00-19	1	88	10
7	30	0.30	0.50	20-49	2	76	10
10	40	0.40	0.90	50-89	3	10	5
15	10	0.10	1.00	90-99	4	05	5
					5	23	7
		(1)		(1)		(1)	(a)

(i)   For 75% or more probability, we need more than 3 days when demand is fulfilled i.e. 3/5 = 60%. Therefore at least 4 days' demand is fulfilled.

(ii)   In this case, 10 cars when there is a 100% chance of all demand being fulfilled based on simulated results.

7. (a) Given the following information regarding a project and the time duration of each activity :

Activity	Preceding activity	Normal Time (days)
A	-	16
B	-	20
C	A	8
D	A	10
E	B,C	6

F	D,E	12

Required :

   (i)   Draw the activity network of the project.

   (ii)   Find critical path and duration of the project.

   (iii)   Find the total float and free-float for each activity. 2+2+4 = 8

(b) Coffee provider is made by a shop by blending different flavours of coffee seeds. 520 gms of Plantation A seeds and 510 gms of Plantation B seeds are ground to yield 1000 gms of Special Blend power. 520 gms of Peaberry seeds and 560 gms of Plantation A seeds are ground to yield 1050 gms of Special Peaberry powder. 500 gms of Plantation B seeds and 510 gms of Robusta seeds are ground to get 980 gms of Normal Blend powder. The contribution per kg of Special Blend, Special Peaberry and Normal Blend are Rs. 100, 120 and 140 respectively. The following stock are available for the production period:

Plantation A : 200 kgs ; Plantation B : 300 kgs ; Peaberry : 250 kgs ; Robusta : 51 kgs. Grinding capacity on a total is limited to 500 kgs of output in a production period.
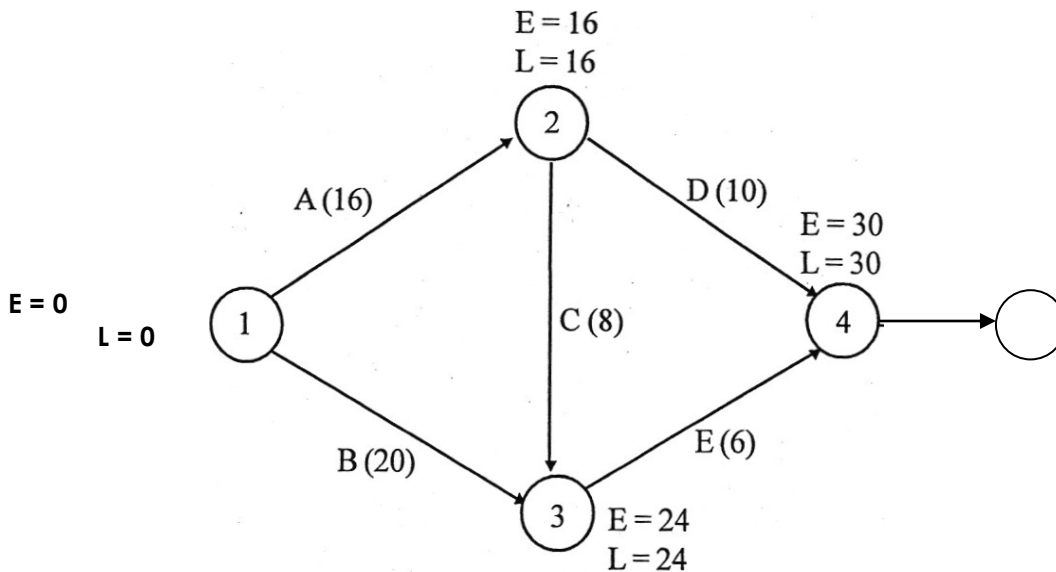
Required :

Formulate the above as a linear programme with the objective to maximize contribution. Identify the variables and give the constraints. (Consider 1000 gms = 1 kg).

                        8

Answer : 7(a)

   (i)   The network for the given problem

A → D → F = 16 + 10 + 12 = 38

B → E → F = 20 + 6 + 12 = 38

   (ii)   A – C – E – F = 16 + 8 + 6 + 12 = 42 days (Critical path)

   (iii)   Total float and free float for each activity.

Activity	Normal time (Days)	EST	EFT	LST	LFT	Total Float	Free Float
A	16	0	16	0	16	0	0
B	20	0	20	4	24	4	4

C	8	16	24	16	24	0	0
D	10	16	26	20	30	4	4
E	6	24	30	24	30	0	0
F	12	30	42	30	42	0	0

Answer : 7(b)

Let x, y and z be the no. of kgs of Special Blend, Special Peaberry and Normal Blend respectively to be produced in the production period.

Then, Objective fn : Max Z = 100x + 120y + 140z

The flowing are resources per kg of output :

	x	Y	Z	Availability
Plantation A	520 / 1000	560/1050		200
Plantation B	510 / 1000		500/980	300
Peaberry		520/1050		250
Robusta			510/980	51

Resource constraint :

$\frac{520}{1000}x + \frac{560}{1050}y \le 200$

$\frac{510}{1000}x + \frac{500}{980}z \le 300$

$\frac{520}{1050}y \le 250$

$\frac{510}{980}z \le 51$

Production Capacity : x + y + z ≤ 500
x, y, z ≥ 0

8. **Write short notes on any four of the following :** 4×4=16
   (a) Business Process Re-engineering

   (b) Assignment

   (c) Features of Target Costing

   (d) Differences between Standard Costing and Kaizen Costing

   (e) Methods of Solving Transportation Problem.

Answer : 8(a)

Business Process Re-engineering (BPR) refers to fundamental rethinking and redesign of business processes to achieve improvement in critical measures of performance such as cost, quality, service,speedand customer satisfaction. In contrast, the concept of Kaizen, which involves small, incremental steps towards gradual improvement, re-engineering involves a giant leap. It is the complete redesign of a process with an emphasis on finding creative new way to accomplish an objective.   It has been described as taking a blank piece of paper and starting from scratch to redesign a

business process. Rather than searching continually for minute improvement, reengineering involves a radical shift in thinking about how an objective should be met. Re-engineering prescribes radical, quick and significant change. Admittedly, it can entail high risks, but it can also bring big rewards. These benefits are most dramatic, when new models are discovered for conducting business.

Answer : 8(b)

Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The Assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different. Thus, in an assignment problem, the question is how the assignments should be made in order that the total cost involved is minimized.

The following are the methods of solving an assignment problem. They are:

(1) Complete Enumeration Method

(2) Simplex Method

(3) Transportation Method and

(4) Hungarian Method

Answer : 8(c)

Target Costing is defined as "a structured approach in determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price." The main features or practices followed in Target Costing are:

Step 1: Identify the market requirements as regards design, utility and need for a new product or improvements of existing product.

Step 2: Set Target Selling Price based on customer expectations and sales forecasts.

Step 3: Set Target Production Volumes based on relationships between price and volume.

Step 4: Establish Target Profit Margin for each product, based on the company's long term profit objectives, projected volumes, and course of action, etc.

Step 5: Set Target Cost (or Allowable cost) per unit, for each product. Target cost = Target selling price less Target profit margin

Step 6: Determine Current Cost of producing the new product, based on available resources and conditions.

Step 7: Set cost reduction Target in order to reduce the Current Cost to the Target Cost.

Step 8: Analyze the Cost Reduction Target into various components and identify cost reduction opportunities using Value Engineering (VE) and Value Analysis (VA) and Activity Based Costing (ABC)

Step 9: Achieve cost reduction and Target profit by Effective Implementation of Cost Reduction decisions

Step 10: Focus on further possibilities of cost reduction ie Continuous Improvement program.

Answer : 8(d)

Basis of difference	Standard costing	Kaizen Costing
Concepts	It is used for cost control	It is used for cost reduction.
	It is assumed that currentmanufacturing conditions remain unchanged.	It assumes continuous improvement.
	The cost focus is on standard costs based on static conditions	The cost focus is on actual costs assuming dynamic conditions
	The aim is to meet cost performance standards	The aim is to achieve cost reduction targets.
Techniques	Standards are set every six or twelve months	Cost reduction targets are set and applied monthly
	Costs are controlled using variance analysis based on standard and actual costs.	Costs are reduced by implementing continuous improvement (kaizen) to attain the target profit or to reduce the gap between target and estimated profit.
	Management should investigateand respond when standards are not met.	Management should investigate and respond when target kaizen amount are not attained.
Employees	They are often viewed as the cause of problems	They are viewed as the source of, and are empowered to find, the solutions.

Answer : 8(e)

The following are the methods of solving transportation problem:

1. The North-West corner rule

2. LeastCost Method

3. Vogel's Approximation Method

1. North West Corner Method (NWCM):

The simplest of the procedures used to generate an initial feasible solution is NWCM. It is so called because we begin with the north west or upper left corner cell of our transportation table. Various steps of this method can be summarized as under:

Step 1: Select the north west (upper left-hand) corner cell of the transportation table and allocate as many units as possible equal to the minimum between available supply and demand requirement, i.e., min

Step 2:Adjust the supply and demand numbers in the respective rows and columns allocation.

Step 3:

(a) If the supply for the first row is exhausted, then move down to the first cell in the second row and first column and go to step 2.

(b) If the demand for the first column is satisfied, then move horizontally to the next cell in the second column and first row and go to step 2.

Step 4:If for any cell, supply equals demand, then the next allocation can be made in cell either in the next row or column.

Step 5:Continue the procedure until the total available quantity is fully allocated to the cells required.

2. Least Cost Method

The allocation according to this method is very useful as it takes into consideration the lowest cost and therefore, reduces the computation as well as the amount of time necessary to arrive at the optimum Solution. Various steps of this method can be summarized as under:

Step 1:
(a) Select the cell with the lowest transportation cost among all the rows or columns of the transportationtable.
(b) If the minimum cost is not unique, then select arbitrarily any cell with this minimum cost.
Step 2:Allocate as many units as possible to the cell determined in step 1 and eliminate that row (column) in which either supply is exhausted or demand is satisfied.
Step 3:
Repeat steps 1 and 2 for the reduced table until the entire supply at different factories is exhausted to satisfy the demand at different warehouses

3. Vogel's Approximation Method

This method is preferred over the other two methods because the initial basic feasible solution obtained is either optimum or very close to the optimum solution. Therefore, the amount of time required to arrive at the optimum solution is greatly reduced. Various steps of thismethod are summarized as under:

Step 1:Compute a penalty for each row and column in the transportation table. The penalty for a given row and column is merely the difference between the smallest elementand the next smallest elementin that particular row or column.

Step 2: Identify the row or column with the largest penalty. In this identified row or column, choose the cell which has the smallest cost and allocate the maximum possible quantity to the lowest cost cell in that row or column so as to exhaust either the supply at a particular source or satisfy demand at a warehouse.

If a tie occurs in the penalties, select that row/column which has minimum cost. If there is a tie in the minimum cost also, select that row/column which will have maximum possible assignments. It will considerably reduce computational work.

Step 3: Reduce the row supply or the column demand by the amount assigned to the cell.

Step 4:If the row supply is now zero, eliminate the row, if the column demand is now zero, eliminate the column, if both the row supply and the column demand are zero, eliminate both the row and column.

Step 5:Re-compute the row and column difference for the reduced transportation table, omitting rows or columns crossed out in the preceding step.

Step 6: Repeat the above procedure until the entire supply at factories isexhausted to satisfy demand at different warehouses.