Paper- 15: MANAGEMENT ACCOUNTING – ENTERPRISE PERFORMANCE MANAGEMENT

Time Allowed: 3 Hours **Full Marks: 100**

The figures in the margin on the right side indicate full marks.
Attempt Question No. 1 (carrying 25 marks), which is compulsory and any five more questions (each carrying 15 marks) from the rest.

Please: (i) Answer all part of a question at one place only.
(ii) Open a new page for answer to a new question.
Working Notes should form part of the answer.
Whenever necessary, suitable assumptions should be made and indicated in answer by the candidates.

1. (a) In each of the cases given below, only one is the most appropriate option. Indicate the correct answer (=1 mark) and show your workings/reasons briefly in support of your answer (=1 mark): [2×5=10]

(i) Back flush costing is most likely to be used when
(A) Management desires sequential tracking of costs
(B) A Just-in-Time inventory philosophy has been adopted
(C) The company carries significant amount of inventory
(D) Actual production costs are debited to work-in-progress

(ii) In calculating the life cycle costs of a product, which of the following items would be included?

I. Planning and concept design costs
II. Preliminary and detailed design costs
III. Testing costs
IV. Production costs
V. Distribution costs
(A) All of the above
(B) IV and V
(C) II, IV and V
(D) IV

(iii) A company's approach to a make-or-buy-decision
(A) Depends on whether the company is operating at or below normal volume
(B) Involves an analysis of avoidable cost
(C) Should use absorption (full) costing
(D) Should use activity-based-costing

(iv) When a manager is concerned with monitoring total cost, total revenue, and net profit conditioned upon the level of productivity, an accountant should normally recommended.

	Flexible Budgeting	Standard Costing
(A)	Yes	Yes
(B)	Yes	No
(C)	No	Yes
(D)	No	No

(v) The selling price of product P is set at ₹ 1,500 for each unit and sales for the coming year are expected to be 500 units.
If the company requires a return of 15% in the coming year on its investment of ₹ 15,00,000 in product P. the TARGET cost for each unit for the coming year is.
(A) ₹ 930
(B) ₹ 990
(C) ₹1,050
(D) ₹1,110

(b) Expand the following abbreviation: [1×5]
(i) CBS
(ii) LCC
(iii) WAITRO
(iv) QFD
(v) MPS

(c) Define the following terms: [1×5]
(i) ERP
(ii) MPS
(iii) Decision Tree Analysis
(iv) Quality Planning
(v) Quality Circle

(d) State whether the following statements given below are 'True' or 'False'. If True, simply rewrite the given statement (1 mark). If False, state it as False (½ mark) and rewrite the correct statement (½ mark): [1x5]

(i) Theory Y style of management is a highly auto crating style.

(ii) The matrix organization structure is suitable for large projects.

(iii) The key factors of 'Theory of Constraints' are Contribution and Profit.

(iv) Life Costing is a technique to establish the total cost of ownership.

(v) To convert the assignment problem into a maximization problem, all elements of the matrix are deducted from the highest element in the matrix.

Answer to 1 (a):

(i) Correct Answer (B)
Because when JIT is used change in inventory is minimum and back flush costing is used in association with JIT and Back Flush costing minimizes efforts and expenses of Inventory.

(ii) Correct Answer (A)
All the costs mentioned in the question are parts of the total life cycle costs.

(iii) Correct Answer (B)

Available resources should be used as efficiently as possible before outsourcing. If the total 'relevant' cost of production is less than the cost to buy the item, it should be produced in-house. The relevant costs are those that can be avoided.

(iv) Correct Answer (A)

A flexible budget is a set of static budgets prepared in anticipation of varying levels of activity. It permits evaluation of actual results when actual production and expected production differ. Setting cost standards facilitates preparation of a variable budget. For example, a standard unit variable cost is useful in determining the total variable cost for a given output.

(v) Correct Answer (C) 10,368 hours

	₹
Sales revenue 500 × ₹ 1,500	7,50,000
Return on Investment required 15% × ₹ 15,00,000	2,25,000
Total cost allowed	5,25,000
Target cost present (5,25,000/500)	₹ 1,050

Answer to 1 (b):

(i) CBS: Cost Breakdown Structure
(ii) LCC: Life Cycle Costing
(iii) WAITRO: World Association of Industrial and Technological Research Organisation
(iv) QFD: Quality Function Deployment
(v) MPS: Master Production Schedule

Answer to 1 (c):

(i) ERP: Enterprise resource planning (ERP) refers to a computer information system that integrates all the business activities and processes throughout an entire organization.

(ii) MPS: The master production schedule (MPS) is basically the production schedule for finished goods. This schedule is usually derived from current orders, plus any forecast requirements.

(iii) Decision Tree Analysis: Decision Trees are excellent tools for helping you to choose between several courses of action. They provide a highly effective structure within which you can lay out options and investigate the possible outcomes of choosing those options. They also help you to form a balanced picture of the risks and rewards associated with each possible course of action.

(iv) Quality Planning: Determine who are the customers and the needs of the customers. It develop product features that respond to the customers' needs and develop processes that are able to product those product features. It transfer the resulting plans to the operating forces.

(v) Quality Circle: Quality Circle is a small group of 6 to 12 employees doing similar work who voluntarily meet together on a regular basis to identify improvements in their respective work areas using proven techniques for analysing and solving work related problems coming in the way of achieving and sustaining excellence leading to mutual upliftment of employees as well as the organisation.

Answer to 1 (d):

(i) False: Theory Y style of management is a highly participative style.
(ii) False: The matrix organization structure is not suitable for large projects.
(iii) False. The key factors of 'Theory of Constrains' are Throughout Inventory & Operating Expenses
(iv) True.
(v) True.

2. (a) Kolkata City Corporation has decided to carry out road repairs on main four entries of the city. The Government has agreed to make a special grant of ₹ 53 Lakhs towards the cost with a condition that the repairs must be done at the lowest cost and quickest time. If conditions so warrant, Supplementary grant will also be considered favourably. The Corporation has floated tenders and 5 Contractors have sent in their bids. In order to expedite work, one road will be awarded to only one contractor.

Contractors/Road	R_1	R_2	R_3	R_4
C_1	9	14	19	15
C_2	7	17	20	19
C_3	9	18	21	18
C_4	10	12	18	19
C_5	10	15	21	16

As a cost Accountant, You have to:
(i) Find out the best way of assigning of repair work to the contractors with the costs.
(ii) If it is necessary to seek supplementary grants, then what should be the amount sought?
(iii) Which of the five Contractors will be unsuccessful in his bid? [3+2+2=7]

(b) A manufacturer of fountain pens selling in the market at ₹ 100 per dozen makes an average net profit of 20% on sales by producing 50,000 dozen per annum against a capacity of 75,000 dozens. His Cost Sheet for the year 2015 was as under:

	Cost per dozen (₹)
Direct Materials	36
Direct Wages	30
Works overheads (50% of this is variable)	10
Sales overhead (25% of this is variable)	4

During next year, he anticipates his fixed costs to increase by 6%, Cost of Direct Materials by 5% and labour (with whom an agreement had been concluded) by 10%. Market

enquiries revealed that the selling price of the product and quantity will remain unchanged during the next year.

An enquiry has been received for the supply of 10,000 dozens to a customer. What could be the lowest quotation, if the business wants to make a minimum profit of ₹ 8 lakhs during the next year? Give detailed workings. [8]

Answer to 2 (a):

I

Road / Contractor	D				
	R_1	R_2	R_3	R_4	R_5
C_1	9	14	19	15	0
C_2	7	17	20	19	0
C_3	9	18	21	18	0
C_4	10	12	18	19	0
C_5	10	15	21	16	0

Column Reduction Reduced Matrix

II

	R_1	R_2	R_3	R_4	R_5
C_1	2	2	1	[0]	~~0~~
C_2	[0]	5	2	4	~~0~~
C_3	2	6	3	3	[0]
C_4	3	[0]	~~0~~	4	~~0~~
C_5	3	3	3	1	~~0~~

III

	R_1	R_2	R_3	R_4	R_5
C_1	2	2	1	[0]	1
C_2	[0]	5	2	4	1
C_3	1	5	2	2	[0]
C_4	3	[0]	~~0~~	4	1
C_5	2	2	2	~~0~~	~~0~~

IV

	R_1	R_2	R_3	R_4	R_5
C_1	1	1	[0]	~~0~~	1
C_2	[0]	5	2	5	2
C_3	~~0~~	4	1	2	[0]
C_4	3	[0]	~~0~~	5	2
C_5	1	1	1	[0]	~~0~~

(i)

Allotment

Road	Contractor	Cost
1	2	7
2	4	12
3	1	19
4	5	16
Total Cost =		**54**

(ii) Since is cost is ₹ 54 Lakh is against grant of 53 lakhs, there is a need of supplementary grant of ₹ 1 lakh.

(iii) Contractor C_3 in our solution has been assigned the dummy roads losses out in the bid.

Answer to 2 (b):

(i) Profitability during the year 2015 (50,000 dozen):

	Per dozen (₹)	Total (₹)
Sales	100	50,00,000
Variable Cost	72	36,00,000
Contribution	28	14,00,000
Less: Fixed Cost	8	4,00,000
Profit (20% of sales)	20	10,00,000

Profitability during the year 2016 (50,000 dozen):

	Per dozen (₹)	Total (₹)
Sales	100	50,00,000
Variable Cost (₹):		
Raw materials (36 x 1.05)	37.80	18,90,000
Direct wages (30 x 1.10)	33.00	16,50,000
Variable works overheads	5.00	2,50,000
Variable sales overheads	1.00	50,000
	76.80	38,40,000

Contribution	23.20	11,60,000
Less: Fixed overheads:		
Works Overhead (₹ 5 x 1.06)	5.30	
Sales overhead (₹ 3 x 1.06)	3.18	
	8.48	4,24,000
Profit (Contribution – Fixed cost)	14.72	7,36,000
Desired profit in 2012		₹ 8,00,000
Profit already earned		₹ 7,36,000
Additional profit desired (for 10,000 dozens)		64,000
Additional profit per dozen		₹ 6.40
Variable cost as above		₹ 76.80
Lowest quotation per dozen		₹ 83.20

3. (a) What do you mean by 'Simulation'? [3]

(b) Patients arriving at a village dispensary are treated by a doctor on a first-come-first-served basis. The inter-arrival time of the patients is known to be uniformly distributed between 0 and 80 minutes, while their service time is known to be uniformly distributed between 15 and 40 minutes.

It is desired to simulate the system and determine the average time a patient has to be in the queue for getting service and the proportion of time the doctor would be idle.

Carry out the simulation using the following sequences of random numbers. The numbers have been selected between 00 and 80 to estimate inter-arrival times and between 15 and 40 to estimate the service times required by the patients.

Series 1	**07**	**21**	**12**	**80**	**08**	**03**	**32**	**65**	**43**	**74**
Series 2	**23**	**37**	**16**	**28**	**30**	**18**	**25**	**34**	**19**	**21**

Assume Starting time as 8.00 A.M. [12]

Answer to 3 (a):

With the help of Linear Programming model, we can easily solve problems of Transportation and Assignment models. However, all the business situations cannot be solved with the LPP model. That is, when all other techniques fail, we resort to the last resort, known as "Simulation". That is why; we call Simulation as the technique of last resort. We would try to simulate the given situation and study the behavior.

To simulate means 'to imitate'. In general, Simulation involves developing a model of real phenomenon and then performing experiments on the model evolved.

In Simulation, to generate data, we make use of Random Nos.

Simulation consists of 4 phases:

(i) Definition of the problem and statement of objectives.
(ii) Construction of an appropriate model.
(iii) Experimentation with the model constructed.
(iv) Evaluation of the results of Simulation.

Answer to 3 (b):

Simulation of data at the village dispensary.

No. of Patients	Inter Arrival time Random No. (Mins.)	Entry time Into queue (Hrs.)	Service Time Random No. (Mins).	Service Start Time (Hrs).	End time (Hrs).	Waiting Time of Patient (Mins).	Idle time of doctor (Mins.)
1	07	8.07	23	8.07	8.30	-	07
2	21	8.28	37	8.30	9.07	2	-
3	12	8.40	16	9.07	9.23	27	-
4	80	10.00	28	10.00	10.28	-	37
5	08	10.08	30	10.28	10.58	20	-
6	03	10.11	18	10.58	11.16	47	-
7	32	10.43	25	11.16	11.41	33	-
8	65	11.48	34	11.48	12.22	-	07
9	43	12.31	19	12.31	12.50	-	09
10	74	01.45	21	01.45	02.06	-	55
				Total (in minutes).		**129**	**115**

Average waiting time of patient = 129/10 = 12.9 minutes.
Average waiting time of doctor =115/10=11.5 minutes.

4. (a) Explain the shortcomings of the Balanced Score card? [4]

(b) State the term 'Total Quality Management'. Describe its Objectives. [4]

(c) The following details relating to the Product 'X' during the month March, 2015 are available. You are required to compute:
(i) Material Price Variance.
(ii) Material Usage Variance.
(iii) Material Cost Variance.
(iv) Labour Rate Variance.
(v) Labour Efficiency Variance.
(vi) Labour Cost Variance.

You are also required to reconcile the standard and actual cost with the help of such variances.
Standard Cost per unit:
Materials 50 kg. @₹ 40 per kg.
Labour 400 hrs. @₹ 1.00 per hour
Actual Cost for the month:
Material 4,900 kgs. @ 42 per kg.
Labour 39,600 hours @₹ 1.10 per hour
Actual production—100 units **[6+1=7]**

Answer to 4 (a):

Short comings under the Balance Scorecard

There are mainly two shortcomings noticed in the Balance Scorecard. They are

(i) Community and Environmental issues are found missing under Balance Scorecard. In fact today these two issues are the most critical issues.
(ii) Competitors have not been included under Balance Scorecard. Companies are required to monitor the environment to track competitor activities and technological developments.

These criticisms mainly stem from the fact that the BSC is not a multiple stakeholder framework. Any performance measurement framework needs to reflect the needs of all the important stakeholders.

Conclusion: these shortcomings, however, should not detract from the inherent merit of the BSC, which helps to clarify, consolidate and gain consensus around the strategy of the organization. BSC is a very powerful tool for strategy implementation. The shortcomings as pointed out may be added as its additional perspectives.

Answer 4 to (b).

Total Quality Management (TQM):

TQM is an integrative philosophy of management for continuously improving the quality of products and processes. TQM is a management approach to long-term success through customer satisfaction. In other words, TQM is a comprehensive and a structured approach to Organizational management that seeks to improve the quality of Products and Processes.

TQM is based on the premise that the quality of Products and Processes is the responsibility of everyone, involved with the creation of consumption of the products or
services which are offered by an organization, requiring the involvement of management, work-force, suppliers and customers to meet or exceed customer expectations. It is a management philosophy and company practices that aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization. It is a management system for a customer-focused organization with total employee-involvement.

Answer to 4 (c):

Standard Cost (SC):	**₹**
Material 100 x 50 kgs. = 5,000 kgs. @ ₹ 40 =	2,00,000
Labour 100 x 400 = 40,000 hrs. @ ₹ 1.00 =	40,000
	2,40,000

Actual Cost (AC)	**₹**
Material 4,900 kgs. @ ₹ 42 =	2,05,800
Labour 39,600 kgs. @ ₹ 1.10 =	43,560
	2,49,360

Material Variances	**₹**
(i) Material Price Variance(MPV)= AQ(SR-AR) = 4,900(40-42)=	9,800 A
(ii) Material Usage Variance(MUV)=SR(SQ-AQ)= 40(5,000-4,900)=	4,000 F
(iii) Material Cost Variance (MCV)=SC-AC = 2,00,000 - 2,05,800 =	5,800 A

Labour Variances	**₹**
(iv) Labour Rate Variance(LRV)=AHP(SR-AR)= 39,600(1.00-1.10) =	3,960 A
(v) Labour Efficiency Variance(LEV)=SR(SH-AHP)=1.00(40,000-39,600)=	400 F
(vi) Labour Cost Variance(LCV)=SC-AC= 40,000-43,560=	3,560 A

Reconciliation between Standard Cost and actual Cost:

		₹
Standard Cost		2,40,000
Add: MPV	9,800 A	
MUV	4,000 F	
MCV	5,800 A	5,800 A
LRV	3,960 A	
LEV	400 F	
LCV	3,560 A	3,560 A
Actual Cost		**2,49,360**

5. (a) State 'Aggregate Planning'? Describe its techniques. [1+4=5]

(b) Ankita Road Liner is a transport Company, that transport goods all over India and it measures quality of services in terms of:

- **Time required to transport goods.**
- **On-time delivery.**
- **Number of lost or damaged cartons.**

To improve its business prospects and performance, the company is seriously considering to install a Scheduling and Tracking System, which involves an annual outlay of ₹ 1,50,000, besides equipments costing ₹ 2,00,000 needed for installation of the system. The company proposes to utilize the proceeds of the Fixed Deposit maturing next month to purchase the equipment. The rate of interest at present on deposit is 10%. The company furnishes the following information about its present and anticipated future performance:

	Current	Expected
On-time delivery	**85%**	**95%**
Variable Cost per carton lost or damaged	**₹ 50**	**₹ 50**
Fixed Cost per Carton lost	**₹ 30**	**₹ 30**
Number of Cartons lost or damaged	**3,000**	**1,000**

The Company expects that each per cent point increase in on-time performance will result in revenue increase of ₹ 18,000 per annum. Contribution margin of 45% is required.

As a Professional Cost and Management Account, advise whether Ankita Road Liner acquire and install the new system. [10]

Answer to 5 (a):

Aggregate Planning is the process of developing, analyzing and maintaining a preliminary approximate schedule of the overall operations of an organization. The aggregate plan generally contains targeted sales forecast, production levels, inventory levels and customer backlogs. The schedule is intended to satisfy demand forecast at a minimum cost. In simple terms, aggregate planning is an attempt to balance capacity and Demand in such a way that the costs are minimized.

Two planning strategies available to the aggregate planner are:

(i) Level Strategy and

(ii) Chase Strategy.

Level Strategy seeks to produce an aggregate plan that maintains a steady production rate and /or a steady level of employment.

Chase Strategy implies demand and capacity period by period. Although it implies greater degree of flexibility for the firm, there is likely to be uneven level of employment from period to period.

Answer to 5 (b):

Costs incurred annually on the installation of new scheduling and tracking system:

	₹
Additional Annual Cost	1,50,000
Interest Foregone on Fixed Deposits (Opportunity Cost) (10% x ₹ 2,00,000)	20,000
Total Costs: (A)	1,70,000

Expected Savings in Costs on the installation of new scheduling and tracking system:

	₹
Contribution margin from additional annual revenue (45% x ₹ 1,80,000) (Pl. refer to the working note)	81,000
Decrease in Variable Cost due to reduced number of cartons lost (3,000-1,000) x 50	1,00,000
Total Savings in Costs : (B)	1,81,000
Net Savings: B-A=l,81,000-1,70,000=	11,000

Decision: It appears from the above that the expected savings exceeds the additional costs by ₹ 11,000. Hence the company should go ahead with the installation of new working schedule and tracking system.

Working Notes:

Computation of Additional Revenue Increase:

(i) As each percentage increase in on-time performance results in revenue increase of ₹ 18,000 per annum, therefore a 10% increase in on-time performance increase will result in additional revenue increase to the tune of ₹ 1,80,000.

6. (a) Seasonal Ltd. is manufacturing Woolen Garments. It faces high demand during Winter and slack demand during Summer. Advise The Production Manager of Seasonal Ltd. how to adjust the production capacity to meet the current demand. [8]

(b) Enumerate the options available to a firm which wants to stimulate demand in order to utilize its idle capacity. [5]

(c) What is Linear Decision Rule? [2]

Answer to 6 (a):

Options which can be used to increase or decrease capacity to match current demand include:

1. **Hire/lay off -** By hiring additional workers as needed or by laying off workers not currently required to meet demand, firms can maintain a balance between capacity and demand.

2. **Overtime -** By asking or requiring workers to work extra hours a day or an extra day per week, firms can create a temporary increase in capacity without the added expense of hiring additional worker.

3. **Part-time or casual labor -** By utilizing temporary workers or casual labor (workers who are considered permanent but only work when needed, on an on-call basis, and typically without the benefits given to full-time workers).

4. **Inventory -** Finished-goods inventory can be built up in periods of slack demand and then used to fill demand during periods of high demand. In this way no new workers have to be hired, no temporary or casual labor is needed, and no overtime is incurred.

5. **Subcontracting -** Frequently firms choose to allow another manufacturer or service provider to provide the product or service to the subcontracting firm's customer. By subcontracting work to an alternative source, additional capacity is temporarily obtained.

6. **Contract manufacturing:** Sub letting spare or idle manufacturing facilities to other firms needing extra facilities. This is the reverse of sub-contracting.

7. **Cross-training.** Cross-trained employees may be able to perform tasks in several operations, creating some flexibility when scheduling capacity.

8. **Other methods.** While varying workforce size and utilization, inventory buildup/ backlogging, and subcontracting are well-known alternatives, there are other, more novel ways that find use in industry. Among these options are sharing employees with countercyclical companies and attempting to find interesting and meaningful projects for employees to do during slack times.

Answer to 6 (b):

Demand can be stimulated by the following ways :

1. **Pricing -** Varying (lower) pricing to increase demand in periods when demand is less than peak. For example, matinee prices for movie theaters, off-season rates for hotels, night time rates for mobile telephone service, and off-season pricing for items that experience seasonal demand.

2. **Promotion -** Advertising, direct marketing, bulk purchase discounts, bonus/free offers and other forms of promotion are used to shift demand.

3. **Back ordering -** By postponing delivery on current orders demand is shifted to period when capacity is not fully utilized. This is really just a form of smoothing demand. Service industries are able to smooth demand by taking reservations or by making appointments in an attempt to avoid walk-in customer. Some refer to this as "partitioning" demand.
4. **New demand creation -** A new, but complementary demand is created for a product or service. When restaurant customers have to wait, they are frequently diverted into a complementary (but not complimentary) service, the bar. Other examples include the addition of video arcades within movie theaters, and the expansion of services at convenience stores.

Answer to 6 (c):

Linear decision rule is an optimizing technique. It seeks to minimize total production costs (labor, overtime, hiring/lay off, inventory carrying cost) using a set of cost-approximating functions (three of which are quadratic) to obtain a single quadratic equation. Then, by using calculus, two linear equations can be derived from the quadratic equation, one to be used to plan the output for each period and the other for planning the workforce for each period.

7. (a) List the benefits of Activity Based Costing? [5]

(b) Karishma Enterprises produces a Product X, using Raw Materials A and B. The Standard Mix of A and B is 1:1 and the Standard Loss is 10% of input. Compute the missing information indicated by '?' based on the data given below: [10]

Particulars	A	B	Total
Standard price of Raw Material (₹/Kg.)	24	30	
Actual Input (Kg.)	?	70	
Actual Output (Kg.)			?
Actual Price (₹/Kg.)	30	?	
Standard Input Quantity (Kg.)	?	?	
Yield Variance (Sub Usage)	?	?	270(A)
Mix Variance	?	?	?
Usage Variance	?	?	?
Price Variance	?	?	?
Cost Variance	0	?	1300(A)

Answer to 7(a):

Benefits of Activity Based Costing:

Activity based costing system has the following main advantages / benefits:

(i) More accurate costing of products/services, customers, SKUs, distribution channels.

(ii) Better understanding overhead.

(iii) Easier to understand for everyone.

(iv) Utilizes unit cost rather than just total cost.

(v) Integrates well with Six Sigma and other continuous improvement programs.

(vi) Makes visible waste and non-value added activities.

(vii) Supports performance management and scorecards

(viii) Enables costing of processes, supply chains, and value streams

(ix) Activity Based Costing mirrors way work is done

Answer to 7(b):

1. Let the Standard input of 'A' = 'Q' kg.
Therefore the total standard input for A+B = 2 Q.
Actual Input = (2Q+10) kgs.
Therefore, Actual Input for 'A' = (2Q+10-70) = (2Q-60)kgs.

2. Material Cost Variance of 'A' = (1) - (2) = Nil.
So, (Qx24) - (2Q-60)x30 =0
Thus, Q=50 kgs.
Therefore, Total Standard Quantity for A &B is 50 kgx2 = 100 kg (Since it is in proportion of 1:1).
Actual input is 100 kg+ 10% normal loss = 110 kg.
Since Actual input for 'B' is 70 kg, for 'A' ,it is 40 kg.

3. Material Cost Variance = MCV of A + MCV of B = 1300 A.
Since MCV of A is Nil, MCV of B is 1300 A.
Let Actual Price of 'B' = ₹ P. So,(I)-(2) =(50x30) - (70xP) = -1300.
Or, 1500-70P =-1300. On Solving, P=40. Hence AP of 'B' is ₹40.

4. Total AQ = 40 + 70 = 110 kg. Hence, RAQ = 110 kg, rewritten in standard mix as 1 : 1 = 55 kgs. each.

	SQ x SP	**AQ x AP**	**AQ x SP**	**RAQ x SP**
	(1)	**(2)**	**(3)**	**(4)**
A B	(WN1)50x24(given) (WNI)50x30(given)	(WN2)40x30 (given) (given) 70x40(WN3)	(WN2)40x24(given) (given)70x30(given)	(WN4)55x24 (given) (WN4)55x30 (given)
Total	**2,700**	**4,000**	**3,060**	**2,970**

8. Write Short Notes on any three out of the following: **[3x5]**

(i) Drum – Buffer – Rope

(ii) Query Tools

(iii) Capacity requirement planning (CRP)

(iv) Mainframes

(v) Enterprise Resource Planning (ERP)

Answer to 8.

(i) Drum – Buffer – Rope:

Drum-buffer-rope is a TOC production application and the name given to the method used to schedule the flow of materials in a TOC facility. Srikanth and Umble (1997), define each component as follows:

- **Drum:** The drum is the *constraint* and therefore sets the pace for the entire system. The drum must reconcile the customer requirements with the system's constraints. In simpler terms, the drum is the rate or pace of production set by the system's constraint.
- **Buffer:** A buffer includes time or materials that *support throughput* and/or due date performance. A buffer establishes some protection against uncertainty so that the system can maximize throughput. A time buffer is the additional planned lead time allowed, beyond the required setup and run times, for materials to reach a specified point in the product flow. Strategically placed, time buffers are designed to protect the system throughput from the internal disruptions that are inherent in any process. A stock buffer is defined as inventories of specific products that are held in finished, partially finished, or raw material form, in order to fill customer orders in less than the normal lead-time. Stock buffers are designed to improve the responsiveness of the system to specific market conditions.
- **Rope:** The rope is a *schedule* for releasing raw materials to the floor. The rope is devised according to the drum and the buffer. The rope ensures that non-capacity constraint resources are subordinate to the constraint. Restated, the rope is a communication process from the constraint to the gating operation that checks or limits material released into the system to support the constraint.

(ii) Query Tools:

Query tools allow the users to find the information needed to perform any specific function. The inability to easily create and execute functional queries is a common weak link in many information systems. A significant cause of that inability, as noted earlier, can be the communication difficulties between a management information systems department and the system users.

Another critical issue toward ensuring successful navigation of the varied information levels and partitions is the compatibility factor between knowledge bases. For maximum effectiveness, the system administrator should ascertain that the varied collection, retrieval, and analysis levels of the system either operate on a common platform, or can export the data to a common platform. Although much the same as query tools in principle, intelligent agents allow the customization of the information flow through sorting and filtering to suit the individual needs of the users. The primary difference between query tools and intelligent agents is that query tools allow the

sorting and filtering processes to be employed to the specifications of management and the system administrators, and intelligent agents allow the information flow to be defined in accord with the needs of the user.

(iii) Capacity requirement planning (CRP):

Capacity requirements' planning is only applicable in firms using MRP or MRP II. CRP uses the information from one of the previous rough-cut methods, plus MRP outputs on existing inventories and lot sizing. The result is a tabular load report for each work center or a graphical load profile for helping plan-production requirements. This will indicate where capacity is inadequate or idle, allowing for imbalances to be corrected by shifts in personnel or equipment or the use of overtime or added shifts. Finite capacity scheduling is an extension of CRP that simulates job order stopping and starting to produce a detailed schedule that provides a set of start and finish dates for each operation at each work center.

A failure to understand the critical nature of managing capacity can lead to chaos and serious customer service problems. If there is a mismatch between available and required capacity, adjustments should be made. However, it should be noted that firms cannot have perfectly-balanced material and capacity plans that easily accommodate emergency order. If flexibility is the firm's competitive priority, excess capacity would be appropriate.

(iv) Mainframes:

The original computerized information systems were based on mainframes. "Mainframe" is a term originally referring to the cabinet containing the central processor unit or "main frame" of a room-filling computer. After the emergence of smaller mini-computer designs in the early 1970s, the traditional large machines were described as "mainframe computers," or simply mainframes. The term carries the connotation of a machine designed for batch rather than interactive use, though possibly with an interactive time-sharing operating system retrofitted onto it.

It has been conventional wisdom in most of the business community since the late 1980s that the mainframe architectural tradition is essentially dead, having been swamped by huge advances in integrated circuit design technology and low-cost personal computing. Despite this, mainframe sales in the United States enjoyed somewhat of resurgence in the 1990s, as prices came down and as large organizations found they needed high-power computing resources more than ever. Supporters claim that mainframes still house 90 percent of the data major businesses rely on for mission-critical applications, attributing this to their superior performance, reliability, scalability, and security compared to microprocessors.

(v) Enterprise Resource Planning (ERP) is the planning of how business resources (materials, employees, customers etc.) are acquired and moved from one state to another.

An ERP system supports most of the business system that maintains in a single database the data needed for a variety of business functions such as Manufacturing,

Supply Chain Management, Financials, Projects, Human resources and customer relationship management.

An ERP system is based on a common database and a modular software design. The common database can allow every department of a business to store and retrieve information in real-time. The information should be reliable, accessible, and easily shared. The modular software design should mean a business can select the modules they need, mix and match modules from different vendors and add new modules of their own to improve business performance.

Ideally, the data for the various business functions are integrated. In practice the ERP system may comprise a set of discrete applications, each maintaining a discrete data store within one physical database.