

FINAL EXAMINATION
GROUP IV
(SYLLABUS 2008)

SUGGESTED ANSWERS TO QUESTIONS
JUNE 2012

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.

Answer 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.*

Q. 1.(a) State whether the following statements given below are 'True' or 'False' with justifications for your answer. If False, state the correct statement. No credit will be given for merely stating – 'True'/'False'.

- (i) ERP bridges the information gap across the organization.
- (ii) Target Costing reduces the overall cost of a product over its entire life-cycle with the help of production, engineering, research and design.
- (iii) JIT manufacturing, based as it is on 'Push through' philosophy, helps to provide the right parts at the right time in right quantity.
- (iv) A Balanced Score Card studies the performance of management by comparing a financial achievement with the amount spent thereon.
- (v) The key factors of 'Theory of constraints' is contribution and profit. [1×5]

2 ♦ Suggested Answers to Question — EPM

(b) Out of the different options given against each of the following statements, only one is the most appropriate option. You are required to write in down :

(i) ABC Ltd., has correct PBIT of ₹ 19.20 Cr. on total assets of ₹ 96 Cr. The company propose to increase assets by ₹ 24 Cr., which is estimated to increase operating profit before Depreciation by ₹ 8.4 Cr. and a net increase in Depreciation by ₹ 4.8 Cr. This will result in ROI :

- A. To decrease by 1%
- B. To increase by 1%
- C. To remain the same
- D. None of these.

(ii) The Selling price of the single product manufactured by a company is fixed at ₹ 1500 per unit. In the coming year, 500 units of the product are likely to be sold. If the total value of investments of the company is ₹ 15 lakhs and it has a target ROI of 15%, the target cost would be :

- A. ₹ 930
- B. ₹ 950
- C. ₹ 1050
- D. None of these.

(iii) A company using a detailed system of standard costing finds that the cost of investigation of variances is ₹ 30,000 and if after investigation, it is found that the situation is out of control, the cost of correction is ₹ 50,000. If no investigation is made, the present value extra cost involved is ₹ 2,00,000. The probability of process, being out of control, is 20%. The cost of investigation would be :

- A. ₹ 6,000
- B. ₹ 10,000
- C. ₹ 40,000
- D. None of these.

(iv) A company makes components and sell internally to its subsidiary and also to external market. The external market price is ₹ 24 per component, which gives a contribution of 40% of sales. For external sales, variable costs include ₹ 1.50 per unit for distribution costs. This is, however, not incurred in internal sales. There are no capacity constraints. To maximize company profit, the transfer price to subsidiary should be :

- A. ₹ 9.60
- B. ₹ 12.90
- C. ₹ 14.40
- D. None of these.

- (v) A particular job requires 800 kgs of material-P.
500 kgs. of the particular material is currently in stock.
The original price of the material-P was ₹ 300 but current resale value of the same has been determined as ₹ 200. If the current replacement price of the material-P is ₹ 0.80 per kg., the relevant cost of the material-P required for the job would be :
- A. ₹ 640
 - B. ₹ 440
 - C. ₹ 300
 - D. None of these.
- [1×5]

(c) Fill in the blanks with appropriate word(s) :

- (i) ___ ___ ___ refers to a computer Information System that integrates all the business activities and processes throughout the entire organization.
 - (ii) _____ consists of shared values, beliefs and norms of organization.
 - (iii) The concept of Value Analysis was first conceived by _____ .
 - (iv) Enterprise Risk Management deals with _____ and _____ affecting value creation.
 - (v) TQM is a _____ oriented decision process aimed at satisfying internal and external customers.
- [1×5]

(d) Expand the following abbreviations :

- (i) CPOF
 - (ii) FAST
 - (iii) RIMS
 - (iv) OSHAS
 - (v) FMEA
- [1×5]

(e) Define the following terms in just one/two sentences :

- (i) Detector
 - (ii) Query tools
 - (iii) Quality Functions Deployment
 - (iv) Succession planning
 - (v) Control chart.
- [1×5]

Answer 1. (a)

(i) **True.**

The ERP System, which provides a platform for integrating the enterprises wide data base, into a meaningful management information system for decision making, becomes a very useful tool in the hands of the Cost Manager.

4 ♦ Suggested Answers to Question — EPM

(ii) **True.**

Target Costing aims to reduce the cost of product at planning, development and design stage of a product rather than production stage.

(iii) **False.**

JIT manufacturing operates as a demand-pull system, producing on demand i.e., making to order.

(iv) **False.**

Balanced Score Card does not focus solely on achieving financial objectives. It is an approach which provides information to management to assist in strategic policy formulation and achievement.

(v) **False.**

The key factors of 'Theory of Constraints' are Throughput, Inventory and operating expenses.

Answer 1. (b)

(i) A. — to decrease by 1%

ROI without Investment		ROI with Investment	
PBIT (₹ Cr)	19.20	(+8.4 -4.8)	22.80
Total Assets (₹ Cr)	96.00	(+24.00)	120.00
ROI	20%		19% (i.e., 1% decrease)

(ii) C. — ₹ 1,050

Sales Revenue = 500 × ₹ 1500 7,50,000

Less : ROI 15% on ₹ 15 Lakhs = 2,25,000

Target Cost = 5,25,000

Target Cost per unit = Target Cost/500 = 5,25,000/500 = ₹ 1,050.

(iii) C. — ₹ 40,000.

Cost of Investigation = ₹ 30,000 + (0.20 × 50,000) = ₹ 40,000.

(iv) B. — ₹ 12.90.

Transfer Price = Marginal Cost – Opportunity Cost

= ₹ 24 × 60% - ₹ 1.50 = ₹ 12.90.

(v) B. — ₹ 440.

500 kgs. of material in stock at resale value = ₹ 200

Balance 300 kgs. of material at current price of ₹ 0.80 = ₹ 240

Relevant Cost of the material = ₹ 440

Answer 1. (c)

(i) **Enterprise Resource Planning** refers to a computer Information System that integrates all the business activities and processes throughout the entire organization.

(ii) **Culture** consists of shared values, beliefs and norms of organization.

(iii) The concept of Value Analysis was first conceived by **Lawrence Miles**.

- (iv) Enterprise Risk Management deals with **risks** and **opportunities** affecting value creation.
- (v) TQM is a **Customer** oriented decision process aimed at satisfying internal and external customers.

Answer 1. (d)

Expand the following abbreviations :

- (i) CPOF — Capacity Planning Using Overall Factors
- (ii) FAST — Function Analysis System Technique
- (iii) RIMS — Risk and Insurance Management Society
- (iv) OSHAS — Occupational Safety and Hazard System
- (v) FMEA — Failure Mode and Effects Analysis

Answer 1. (e)

- (i) **Detector** : tracks the performance and can be visualized as a scanning system and it feeds on information. In fact the Detector is another name for Management Information System.
- (ii) **Query tools** : allow the users to find the information needed to perform any specific function.
- (iii) **Quality Function Deployment (QFD)** : is a structured approach to defining customer needs or requirements and translating them into specific plans to produce products to meet those needs.
- (iv) **Succession Planning** : is the systematic process of defining future management requirements and identifying candidates who best meet those requirements. It involves using the supply of labour within the organization for future staffing needs.
- (v) **Control Chart** : is a quality control tool to maintain a process under statistical control.

Q. 2. XYZ Co. has received an once-off export order for its sole product that would require the use of half of the factory's total capacity, which is estimated at 4 Lakhs units/annum. The condition of the export order is that it has to be accepted in full; acceptance of part quantity is not allowed.

The factory is currently operating at 60% level to meet the demands of its domestic customers. As against the current price of ₹ 6/- per unit, the export offer is ₹ 4.70/unit, which is less than the total cost of the current production.

The cost breakdown is given below :	₹ /unit.
Direct material	2.50
Direct labour	1.00
Variable expenses	0.50
Fixed overhead	<u>1.00</u>
Total Cost	<u>5.00</u>

The company has the following options :

- (a) Accept the export order and cut back domestic sales as necessary.
- (b) Remove the capacity constraints by installing necessary balancing equipment and also by working overtime to meet both domestic and export demand. This will increase fixed overhead by ₹ 15,000 annually and additional cost for overtime work will amount to ₹ 40,000 for the year.

6 ♦ Suggested Answers to Question — EPM

(c) Appoint a sub-contractor to manufacture the additional requirement and meet the domestic & export requirements in full by supplying the raw materials, paying a conversion charge @ ₹ 2 per unit and appointing a supervisor at a salary of ₹ 3,000 per month for checking the quality of the product and controlling operations at the manufacturing unit.

(d) Refuse the export order.

Required : (i) A statement of costs and profits under each of the above 4 options. [3×4]

(ii) Your recommendation, with reasons, as to which of these options the company should decide upon. [3]

Answer 2.

Working Notes :

Calculation of Variable Cost/unit.	₹
Direct Material	2.50
Direct Labour	1.00
Variable expenses	0.50
Variable cost/unit	4.00

Calculation of Fixed cost (at 60% level)

$$= 4,00,000 \text{ units} \times 60/100 \times ₹ 1 \text{ per unit} = ₹ 2,40,000$$

Option (a): Profitability Statement (Accept export order and cut back domestic sales as necessary)

	₹
Sales :	
Export (2,00,000 units @ ₹ 4.70)	9,40,000
Domestic (2,00,000 @ ₹ 6.00)	12,00,000
	21,40,000
Less : Variable cost (4,00,000 units @ ₹ 4)	16,00,000
Contribution	5,40,000
Less : Fixed Overhead	2,40,000
Profit	3,00,000

Option (b): Profitability Statement (Installation of balancing eqpt. & increase capacity to meet both domestic and export demand)

	₹	₹
Sales: Export (2,00,000 units @ ₹ 4.70)		9,40,000
Domestic (2,40,000 @ ₹ 6.00)		14,40,000
		23,80,000
Less : Variable cost (4,40,000 units @ ₹ 4)	17,60,000	
Overtime payment	40,000	18,00,000
Contribution		5,80,000
Less : Fixed Overhead	2,40,000	
Extra Fixed Cost	15,000	2,55,000
Profit		3,25,000

Option (c): Profitability Statement (Sub contracting)

		₹
Sales (in Option b)		23,80,000
Less : Variable Cost (4,00,000 units @ ₹ 4)	16,00,000	
Sub-contract charges :		
Material (₹ 2.50 × 40,000 units)	1,00,000	
Conversion (₹ 2.00 × 40,000 units)	80,000	
	<u>17,80,000</u>	
Contribution		6,00,000
Less : Fixed overheads	2,40,000	
Supervision charges	36,000	
	<u>2,76,000</u>	
Profit		<u>3,24,000</u>

Option (d): Profitability Statement (Refuse Export Order)

		₹
Sales : Domestic (2,40,000 units × ₹ 6.00)		14,40,000
Less : Variable Cost (2,40,000 units × ₹ 4.00)		9,60,000
Contribution		4,80,000
Less Fixed cost		2,40,000
Profit		<u>2,40,000</u>

Analysis :

From the above, it is observed that the Profit is maximum, by installation of balancing equipment and increasing capacity to meet both domestic as well as export order. Hence option (b) is recommended.

Q. 3. (a) What are the objectives of JIT production methods? [4]

(b) Define Bench Marking. Outline the different types of Bench Marking? [1+3]

(c) What are the options for demand stimulation? How you would adjust capacity to match current demand? [3+4]

Answer 3. (a)

Just in time (JIT) is a production strategy that strives to improve a business return on investment by reducing in-process inventory and associated carrying costs. The philosophy of JIT is simple: inventory is waste. JIT inventory systems expose hidden cost of keeping inventory, and are therefore not a simple solution for a company to adopt.

The objectives of JIT are as follows :

- Produce only the products the customer wants.
- Produce products only at the rate that the customer wants them.
- Produce with perfect quality.
- Produce with minimum lead time.
- Produce products with only those features the customer wants.

8 ♦ *Suggested Answers to Question — EPM*

- Produce with no waste of labor, material or equipment — every movement must have a purpose so that there is zero idle inventory.
- Produce with methods that allow for the development of people.

Answer 3. (b)

Benchmarking is the process of comparing one's business processes and performance metrics to industry bests or best practices from other industries. Dimensions typically measured are quality, time and cost. In the process of benchmarking, management identifies the best firms in their industry, or in another industry where similar processes exist, and compare the results and processes of those studied (the "targets") to one's own results and processes.

Types of Benchmarking are :

- **Process benchmarking** - the initiating firm focuses its observation and investigation of business processes with a goal of identifying and observing the best practices from one or more benchmark firms.
- **Financial benchmarking** - performing a financial analysis and comparing the results in an effort to assess your overall competitiveness and productivity.
- **Benchmarking from an investor perspective**- extending the benchmarking universe to also compare to peer companies that can be considered alternative investment opportunities from the perspective of an investor.
- **Performance benchmarking** - allows the initiator firm to assess their competitive position by comparing products and services with those of target firms.
- **Product benchmarking** - the process of designing new products or upgrades to current ones.
This process can sometimes involve reverse engineering which is taking apart competitors products to find strengths and weaknesses.
- **Strategic benchmarking** - involves observing how others compete. This type is usually not industry specific, meaning it is best to look at other industries.
- **Functional benchmarking** - a company will focus its benchmarking on a single function to improve the operation of that particular function. Complex functions such as Human Resources, Finance and Accounting and Information and Communication Technology are unlikely to be directly comparable in cost and efficiency terms and may need to be disaggregated into processes to make valid comparison.
- **Best-in-class benchmarking** - involves studying the leading competitor or the company that best carries out a specific function.
- **Operational benchmarking** - embraces everything from staffing and productivity to office flow and analysis of procedures performed.
- **Energy benchmarking** - process of collecting, analysing and relating energy performance data of comparable activities with the purpose of evaluating and comparing performance between or within entities'. Entities can include processes, buildings or companies. Benchmarking may be internal between entities within a single organization, or - subject to confidentiality restrictions - external between competing entities.

Answer 3. (c)

Demand stimulation: Options for situations in which demand needs to be increased in order to match capacity include :

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.

Adjusting Capacity :

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

1. **Hire/layoff** - 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.

Q. 4. (a) Explain how an organization would benefit from a Product Life-Cycle Costing exercise? [2]

(b) TECHNOTIK LTD., specializes in the manufacture of Computers. It is planning to introduce a new computer specially designed for children. Development of the New Computer is to begin shortly and TECHNOTIK LTD., is in the process of preparing a Product Life-Cycle Budget. It expects the new product to have a life-cycle of 3 years from the time of its introduction in the market before the computer becomes obsolete due to technological advancement of other competitive products.

10 ♦ Suggested Answers to Question — EPM

The following information is available :

Particulars	Year-1	Year-2	Year-3
Units manufactured & sold	25000	100000	75000
Computers per batch	40	50	50
Price per Computer (₹)	4500	4000	3500
R&D and Design Cost (₹)	450 Lakh	50 Lakh	-
Production Cost:			
Variable Cost per unit (₹)	1600	1500	1500
Variable Cost per batch (₹)	7000	6000	6000
Fixed Cost (₹)	300 Lakh	300 Lakh	300 Lakh
Marketing Cost:			
Variable Cost per unit (₹)	360	320	280
Fixed Cost (₹)	200 Lakh	150 Lakh	150 Lakh
Distribution Cost:			
Units produced per batch	20	16	12
Variable Cost per unit (₹)	100	100	100
Variable Cost per batch (₹)	1200	1200	1000
Fixed Cost (₹)	120 Lakh	120 Lakh	120 Lakh
Customer Service Cost per unit (₹)	200	150	150

You are required to prepare budgeted life-cycle operating profit for the new computer.

[2+2+2+2]

- (c) Your company fixes the inter-divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The Budget for Division A for 2011-12 appears as under :

	₹
Fixed assets	5,00,000
Current assets	3,00,000
Debtors	2,00,000
Annual Fixed Cost of the Division	8,00,000
Variable Cost per unit of Product	10
Budgeted Volume	4,00,000 units/year
Desired ROI	28%

Determine the transfer Price for Division A.

[5]

Answer 4. (a)

Life Cycle life-cycle costing exercise considers the entire cost life cycle of the product, and thus provides a more complete perspective of product costs and product profitability.

It is used to manage the total costs of the product across its entire life cycle. For example, design and development costs may be increased in order to decrease manufacturing costs and service costs later in the life cycle. Thus, products that are loss making initially but profitable in longer term will be accepted.

Answer 4. (b)

TECHNOTIK LTD
PREPARATION OF BUDGETED LIFE CYCLE OPERATING PROFIT

Particulars	(Amount in ₹ Lakhs)			
	Year-1	Year-2	Year-3	Total
Sales Revenue (A) (25 × 45)	1125	4000	2625	7750
R&D and Design Cost	450	50	-	500
Production Cost:				
Variable Cost	400	1500	1125	3025
Variable Cost per batch				
Unit manufactured × Variable Cost per batch				
Computer per batch	43.75	120	90	253.75
Fixed Cost	300	300	300	900
Marketing Cost:				
Variable Cost	90	320	210	620
Fixed Cost	200	150	150	500
Distribution Cost:				
Variable Cost	25	100	75	200
Variable Cost for batch				
Unit manufactured × Variable Cost per batch				
Unit produced per batch	15	75	62.50	152.50
Fixed Cost	120	120	120	360
Customer Service Cost	50	150	112.50	312.50
Total Cost	1693.75	2885	2245	6823.75
OPERATING PROFIT	(568.75)	1115.00	380.00	926.25

Answer 4. (c)

	₹
Variable Cost =	10.00
Fixed Cost per unit =	8,00,000 ÷ 4,00,000
Required Return	10,00,000 × 28% / 4,00,000
Total Cost or Transfer price	12.70

Q. 5. (a) Goodlite Company has installed 200 electric bulbs of a certain brand. The company follows the policy of replacing the bulbs as and when they fail. Each replacement costs ₹ 2. The probability distribution of the life of the bulbs is as given below :

Life of Bulb (weeks)	1	2	3	4	5
% of Bulbs	0.10	0.30	0.45	0.10	0.05

Determine the cost/week of the replacement policy in the long run.

[7]

12 ♦ Suggested Answers to Question — EPM

- (b) After observing heavy congestion of customers over a period of time in a petrol station, Mr. X has decided to set up a petrol pump facility on his own in a nearby site. He has compiled statistics relating to the potential customer arrival pattern and service pattern as given below. He has also decided to evaluate the operations by using the simulation technique.

Arrivals		Services	
Inter-arrival time (minutes)	Probability	Inter-arrival time (minutes)	Probability
2	0.22	4	0.28
4	0.30	6	0.40
6	0.24	8	0.22
8	0.14	10	0.10
10	0.10		

Assume :

- (i) The clock starts at 8.00 hours
- (ii) Only one pump is set up
- (iii) The following 12 Random Numbers are to be used to depict the customer arrival pattern.
78, 26, 94, 08, 46, 63, 18, 35, 59, 12, 97 and 82.
- (iv) The following 12 Random Numbers are to be used to depict the customer service pattern.
44, 21, 73, 96, 63, 35, 57, 31, 84, 24, 05 and 37.

You are required to find out the

- (i) Probability of the pump being idle and
- (ii) Average time spent by a customer waiting in queue.

[8]

Answer 5. (a)

Week	Probability	Total Product
1	0.10	$0.10 \times 1 = 0.10$
2	0.30	$0.30 \times 2 = 0.60$
3	0.45	$0.45 \times 3 = 1.35$
4	0.10	$0.10 \times 4 = 0.40$
5	0.05	$0.05 \times 5 = 0.25$
		$= 2.70$

Average no. of Replacements = $200/2.7 = 74$

Therefore, cost per week = $74 \times ₹ 2 = ₹ 148$.

Computation of expected no. of Replacements

Week		
0	$N_0 = N_0 P_0 = 200 \times 0 = 0$	0
1	$N_1 = N_0 P_1 = 200 \times 0.1 = 20$	20
2	$N_2 = N_0 P_2 + N_1 P_1 = 200 \times 0.3 + 20 \times 0.1 = 60 + 2 = 62$	62
3	$N_3 = N_0 P_3 + N_1 P_2 + N_2 P_1 = 200 \times 0.45 + 20 \times 0.30 + 62 \times 0.1 = 90 + 6 + 6.2 = 102.2$	102.2
4	$N_4 = N_0 P_4 + N_1 P_3 + N_2 P_2 + N_3 P_1 = 200 \times 0.1 + 20 \times 0.45 + 62 \times 0.3 + 102.2 \times 0.1 = 20 + 9 + 18.6 + 10.22 = 57.82$	57.82
5	$N_5 = N_0 P_5 + N_1 P_4 + N_2 P_3 + N_3 P_2 + N_4 P_1 = 200 \times 0.5 + 20 \times 0.1 + 62 \times 0.45 + 102.2 \times 0.30 + 57.82 \times 0.1 = 10 + 2 + 27.9 + 30.66 + 5.782 = 76.342$	76.342

Computation of Average cost of Group Replacements

Week	Individual Replacement	Cost of Individual Replacements	Cumulative Individual Replacement Cost	Average Cost
		₹	₹	₹
1	20	40	40	40
2	62	124	164	82
3	102	204	368	122.67
4	58	116	484	121.00*
5	76	152	636	127.2

* Replacement is to be done once in four weeks.

Answer 5. (b)

Random no. Table :

Inter-arrival time				Service time			
Minutes	Probability	Cumulative Probability	Range	Minutes	Probability	Cumulative Probability	Range
2	0.22	0.22	00-21				
4	0.30	0.52	22-51	4	0.28	0.28	00-27
6	0.24	0.76	52-75	6	0.40	0.68	28-67
8	0.14	0.90	76-89	8	0.22	0.90	68-89
10	0.10	1.00	90-99	10	0.10	1.00	90-99

Sl. no.	Random no. for inter arrival	Inter arrival time	Entry time in queue	Service start time	Random no. for service	Service time	Service end time	Waiting time of customer	Idle time
1	78	8	8.08	8.08	44	6	8.14	-	8
2	26	4	8.12	8.14	21	4	8.18	2	-
3	94	10	8.22	8.22	73	8	8.30	-	4
4	08	2	8.24	8.30	96	10	8.40	6	-
5	46	4	8.28	8.40	63	6	8.46	12	-
6	63	6	8.34	8.46	35	6	8.52	12	-
7	18	2	8.36	8.52	57	6	8.58	16	-
8	35	4	8.40	8.58	31	6	9.04	18	-
9	59	6	8.46	9.04	84	8	9.12	18	-
10	12	2	8.48	9.12	24	4	9.16	24	-
11	97	10	8.58	9.16	05	4	9.20	18	
12	82	8	9.06	9.20	37	6	9.26	14	
Total time								140	12

Average waiting time spent by the customer = $140/12 = 11.67$ mins.

Probability of idle time of petrol station = $12/86 = 0.1395$ ie., 14%

Q. 6. (a) S. V. Ltd., manufactures by mixing three raw materials. For every batch of 100 kg. of BXE, 125 kg. of raw materials are used. In April, 2012, 60 batches were prepared to produce an output of 5,600 kg. of BXE. The standard and actual particulars for April, 2012 are as under :

Raw material	Mix (%)	Price/kg.	Mix (%)	Price per kg.	Quantity of raw materials purchased (kg.)
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

Calculate all variances.

[9]

(b) Alfa Limited Company's Cost Accountant was given the following information regarding the overheads for 31st March, 2010.

A – Overhead Cost Variance ₹ 1400 Adverse.

B – Overhead Volume Variance ₹ 1,000 Adverse.

C – Budgeted Hours for 31st March, 2010 — 1200 hours.

D – Budgeted Overheads for 31st March, 2010 — ₹ 6000.

E – Actual Rate of recovery of overheads ₹ 8 per hour.

As a professional accountant, you have to assist him in computing the following for 31 st March, 2010 :

- (i) Overhead Expenditure Variance
- (ii) Actual overhead incurred
- (iii) Actual hours for actual production
- (iv) Overheads Capacity Variance
- (v) Overheads Efficiency Variance
- (vi) Standard Hours for Actual Production.

Answer 6. (a)

	Standard data			Actual data		
	Qty	Price	Value	Qty	Price	Value
A (7500* × .5)	3750	20	75000	4500	21	94500
B (7500 × .3)	2250	10	22500	1500	8	12000
C (7500 × .2)	1500	5	7500	1500	6	9000
	60 × 125=7500		105000	7500		115500
(-) standard loss	60 × 25=1500			1900 (7500-5600)		
	6000		105000	5600		115500

	(1) SQSP	(2) RSQSP	(3) AQSP	(4) AQAP
A	3500 × 20 = 70000		4500 × 20 = 90000	
B	2100 × 10 = 21000		1500 × 10 = 15,000	
C	1400 × 5 = 7000		1500 × 5 = 7500	
Total	₹ 98000	₹ 105000	₹ 112500	₹ 115500

* Quantity of raw material = $\frac{60 \times 100}{100} \times 125 = 7500$ kgs.

$$\text{SQ FOR A} = \frac{5600}{6000} \times 3750, \quad \text{B} = \frac{5600}{6000} \times 2250, \quad \text{C} = \frac{5600}{6000} \times 1500$$

(3500) (2100) (1400)

- (1) SQSP = Standard Cost of Standard Material = ₹ 98000
- (2) RSQSP = Revised Standard Cost of Material = ₹ 105000
- (3) AQSP = Standard Cost of Actual Material = ₹ 112500

(4) AQAP = Actual Cost of Material = ₹ 115500.

- a. Material yield variance = 1-2 = ₹ 7000 (A)
- b. Material mix variance = 2-3 = ₹ 7500 (A)
- c. Material usage variance = 1-3 = ₹ 14500(A)
- d. Material price variance = 3-4 = ₹ 3000 (A)
- e. Material cost variance = 1-4 = ₹ 17500 (A)

Answer 6. (b)

(i) **Overhead expenditure variance :**

$$\begin{aligned}\text{Overhead cost variance} &= \text{Expenditure variance} + \text{volume variance} \\ 1400 \text{ (Adverse)} &= \text{Expenditure variance} + 1000 \text{ (Adverse)} \\ \text{Expenditure variance} &= 1400 \text{ (Adverse)} - 1000 \text{ (Adverse)} = 400 \text{ (Adverse)}.\end{aligned}$$

(ii) **Actual overhead incurred :**

$$\begin{aligned}\text{Overhead expenditure variance} &= \text{Budgeted Fixed overheads} - \text{Actual fixed overheads.} \\ \text{Or Actual fixed overheads} &= \text{Budgeted Fixed overheads} - \text{Overhead expenditure variance.} \\ &= 6000 \text{ (Favourable)} - 400 \text{ (Adverse)} = 6000 - (-400) = ₹ 6400.\end{aligned}$$

(iii) **Actual hours for actual production** = Actual overheads incurred/Actual rate of recovery of overheads
= 6400/8 = 800 hours.

(iv) **Overhead capacity variance** = Standard rate (Revised Budgeted or Actual hours - Budgeted hours)
= 6000/1200 (800-1200) = ₹ 2000 (Adverse)

(v) **Overhead efficiency variance :**

$$\begin{aligned}\text{Volume variance} &= \text{Capacity variance} + \text{Efficiency variance} \\ \text{or Efficiency variance} &= \text{Volume variance} - \text{Capacity variance} = 1000 \text{ (Adverse)} - 2000 \text{ (Adverse)} \\ &= -1000 + 2000 = 1000 \text{ (Favourable)}\end{aligned}$$

(vi) **Standard Hours for Actual Production** = Volume variance (in terms of labour hours) – Standard rate per hour = Standard hours for Actual output – Budgeted hours.

$$\text{or } 1000 \text{ Adverse} = 6000/1200 \text{ (Standard hours for actual output - 1200 hrs.)}$$

$$\text{or } 1000 \times 1200/6000 = \text{Standard hours for actual output - 1200 hours.}$$

$$\text{or Standard hours for actual production} = -200 \text{ hours} + 1200 \text{ hours} = 1000 \text{ hours.}$$

Q. 7. (a) What are the basic elements of Control Systems? [8]

(b) The impact of Control System on human behaviour can be better explained by Budgetary Control. Explain. [7]

Answer 7. (a)

Basic elements of a control system :

The following are the basic elements of a control system :

- (i) **A Control Object** or the variable to be controlled : A Control Object is the variable of the system behaviour chosen for monitoring and control. The choice of the Control Object is the most important consideration in studying and designing a control system. Variations in the status of the Control Object i.e., its behaviour, become the stimuli which trigger the functioning of the control system. Without these variations, the system has no reasons for existence.
- (ii) **A Detector** or Scanning Sub-system : The Detector tracks the performance and can be visualized as a scanning system and it feeds on information. In fact the Detector is another name for the Management Information System (MIS).
- (iii) **A Comparator/Assessor** : The output of the scanning system constitutes the energizing input of the comparator. Its function is to compare deviation of the control object from the pre-determined standard or norm. The deviation becomes input to the activating system.
- (iv) **An Effector** or action taking sub-system : The Effectors are the true decision maker. It evaluates alternative course of corrective action in the light of the significance of the deviations transmitted by the comparator. On the basis of this comparison, the System output is classified as being in control. If out of control, it initiates corrective action.
- (v) **Communication Network** : These are devices that transmit information between the Detector and the Assessor and between the Assessor and the Effectors.

Answer 7. (b)

Control System exerts a considerable influence on an individual's behaviour in an organization. The impact of Control System on human behaviour can be better explained with the aid of examining Budgetary Control.

- (i) **Budget Formulation** : A Bottom-up approach, instead of top-down, involving employees, makes them committed towards meeting the budget.
- (ii) **Fixing Budgets** : Sales, Production and other targets that are determined / fixed are challenging, so as to bring out best out of an individual's efforts.
- (iii) **Performance Evaluation** : This should be done in a constructive manner rather than in a vindictive manner. To ensure proper accountability, an appropriate evaluation with a positive outlook is a necessity.

Budgetary exercise is not simply a tool for planning in control but more importantly a means of achieving coordination between different departments of an enterprise. Cooperation and Coordination between employees and the management and among the employees themselves through the Budgetary Control System i.e., involving all in the process, will yield better results.

Q. 8. Write Short Notes on :

- (i) 5 S's concept in Quality Management.
- (ii) "Zero Defects" and "Rights First Time".
- (iii) Six Sigma process in Quality Management.

[3×5]

Answer 8. (i)

5S is the name of a workplace organization method that uses a list of five Japanese words: *seiri*, *seiton*, *seiso*, *seiketsu*, and *shitsuke*. The list describes how to organize a work space for efficiency and effectiveness. There are five primary 5S phases: sorting, straightening, systematic cleaning, standardizing, and sustaining.

Sorting (Seiri) :

Eliminate all unnecessary tools, parts, and instructions. Go through all tools, materials, and so forth in the plant and work area. Keep only essential items and eliminate what is not required, prioritizing things as per requirements and keeping them in easily-accessible places. Everything else is stored or discarded.

Stabilizing or Straightening Out (Seiton) :

There should be a place for everything and everything should be in its place. The place for each item should be clearly indicated.

Sweeping or Shining (Seiso) :

Standardized cleaning-point at a 5S organized plant

Clean the workspace and all equipment, and keep it clean, tidy and organized. At the end of each shift, clean the work area and be sure everything is restored to its place. This makes it easy to know what goes where and ensures that everything is where it belongs. Spills, leaks, and other messes also then become a visual signal for equipment or process steps that need attention. A key point is that maintaining cleanliness should be part of the daily work - not an occasional activity initiated when things get too messy.

Standardizing (Seiketsu) :

Work practices should be consistent and standardized. All work stations for a particular job should be identical. All employees doing the same job should be able to work in any station with the same tools that are in the same location in every station. Everyone should know exactly what his or her responsibilities are for adhering to the first 3S's.

Sustaining the Practice (Shitsuke) :

Maintain and review standards. Once the previous 4S's have been established, they become the new way to operate. Maintain focus on this new way and do not allow a gradual decline back to the old ways. While thinking about the new way, also be thinking about yet better ways. When an issue arises such as a suggested improvement, a new way of working, a new tool or a new output requirement, review the first 4S's and make changes as appropriate. It should be made as a habit and be continually improved.

Answer 8. (ii)

Philip Crosby promoted the phrases “zero defects” and “right first time”. According to him “Zero defects” doesn’t mean mistakes never happen, rather that there is **no allowable number of errors** built into a product or process and that you get it right first time.

Philip Crosby believes **management** should take prime responsibility for quality, and workers only follow their managers’ example. He defined the Four Absolutes of Quality Management.

- Quality is **conformance** to requirements
- Quality **prevention** is preferable to quality inspection
- **Zero defects** is the quality performance standard
- Quality is measured in **monetary** terms - the price of non-conformance

Crosby's 14 Steps to Quality Improvement

1. Management is **committed to quality** - and this is clear to all
2. Create quality improvement teams - with (senior) representatives from all departments.
3. Measure processes to determine current and potential quality issues.
4. Calculate the cost of (poor) quality
5. **Raise quality awareness** of all employees
6. Take action to correct quality issues
7. **Monitor progress** of quality improvement - establish a zero defect committee.
8. Train supervisors in quality improvement
9. Hold "zero defects" **days**
10. Encourage employees to create their own quality improvement goals
11. Encourage employee communication with management about **obstacles to quality**
12. Recognise participants' effort
13. Create **quality councils**
14. Do it all over again - quality improvement does not end.

Answer 8. (iii)

Six Sigma is a business management strategy, originally developed by Motorola in 1986. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization. A six sigma process is one in which 99.99966% of the products manufactured are statistically expected to be free of defects (3.4 defects per million). Motorola set a goal of "six sigma" for all of its manufacturing operations, and this goal became a byword for the management and engineering practices used to achieve it.

Six Sigma projects follow two project methodologies. These methodologies, composed of five phases each, bear the acronyms DMAIC and DMADV.

- DMAIC is used for projects aimed at improving an existing business process.
- DMADV is used for projects aimed at creating new product or process designs.

DMAIC

The DMAIC project methodology has five phases :

- *Define* the problem, the voice of the customer, and the project goals, specifically.
- *Measure* key aspects of the current process and collect relevant data.
- *Analyze* the data to investigate and verify cause-and-effect relationships. Determine what the relationships are, and attempt to ensure that all factors have been considered. Seek out root cause of the defect under investigation.
- *Improve* or optimize the current process based upon data analysis using techniques such as design of experiments, poka yoke or mistake proofing, and standard work to create a new, future state process. Set up pilot runs to establish process capability.

20 ♦ *Suggested Answers to Question — EPM*

- *Control* the future state process to ensure that any deviations from target are corrected before they result in defects. Implement control systems such as statistical process control, production boards, visual workplaces, and continuously monitor the process.

The DMADV project methodology, also known as DFSS (“Design For Six Sigma”), features five phases :

- *Define* design goals that are consistent with customer demands and the enterprise strategy.
- *Measure* and identify CTQs (characteristics that are Critical To Quality), product capabilities, production process capability, and risks.
- *Analyze* to develop and design alternatives, create a high-level design and evaluate design capability to select the best design.
- *Design* details, optimize the design, and plan for design verification. This phase may require simulations.
- *Verify* the design, set up pilot runs, implement the production process and hand it over to the process owner(s).