

N.B. : (1) Attempt any five questions.

(2) Figures to the right indicate marks to a sub-question.

(3) Graph paper will be supplied on request.

(4) Use of scientific, held, non-programmable calculator is allowed.

Q.1]

(a) Find values of a and b , where $\frac{10\sqrt{2}}{\sqrt{18}-\sqrt{3}+\sqrt{5}} - \frac{\sqrt{10}+\sqrt{18}}{\sqrt{8}+\sqrt{3}-\sqrt{5}} = a + b\sqrt{5}$. [10]

(b) An investor has an annual income of Rs. 116 from bonds bearing 3% and 5% interest. Then he buys 25% more of the 3% bonds and 40% more of the 5% bonds, thereby increasing his annual income by Rs. 41. Find his initial investment in each type of bond. [10]

Q.2]

(a) Find the term independent of x in the expansion of $(2x^3 + \frac{1}{x^8})^{11}$. [10]

(b) Seven persons including two ladies, three gents and two children go for a movie.

How many different seating arrangements can be done in a line so that, [10]

(i) anybody can sit anywhere.

(ii) the ladies occupy the end seats.

(iii) Gents occupy the end seats, as well as the middle seat

(iv) Children are never given the end seats.

Q.3]

(a) Find the equation of a circle passing through A(4, -2), B(-3, -1) and with radius 5. [10]

- (b) A triangular plot of land has 60 m. frontage on one street 80 m. on another street at right angles to the first. Find the dimensions of the large rectangular building that can be erected facing one of the streets. [10]

Q.4]

- (a) By finding inverse matrix solve following system, [10]

$$2x - 2y - z = 4, \quad 3x + 4y - 2z = 11, \quad 3x - 2y + 4z = 11.$$

- (b) Without actual expansion as far as possible, prove that [10]

$$\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a - b)(b - c)(c - a)(ab + bc + ca).$$

Q.5]

- (a) Out of 240 students in college 130 students are in N.C.C. 110 are in N.S.S. and 80 are in other activity in this 40 are N.C.C. and N.S.S both, 35 are N.C.C and other activity and 30 are N.S.S. and other activity but 20 student are take part in all three. [10]

Find the number of students takes part in

- (i). Atleast any one.
- (ii). None of them.
- (iii). Only N.S.S.
- (iv). Only N.S.S and N.S.S but not in other activity.

- (b) Let $y = 2x^3 - 9x^2 + 12x - 3$. Find the values of x for which y is maximum or minimum and find these maximum or minimum values of y . [10]

Q.6]

- (a) If $u = \begin{vmatrix} x^2 & y^2 & z^2 \\ x & y & z \\ 1 & 1 & 1 \end{vmatrix}$, then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. [10]

(b) Find the following limits: [10]

(i) $\lim_{x \rightarrow 0} \frac{6^x - 4^x}{x}$ (ii) $\lim_{n \rightarrow \infty} \frac{1.3 + 3.5 + 5.7 + \dots \text{ to } n \text{ terms}}{n^3}$.

Q.7]

(a) Given demand function as $p = (6 - x)^2$ and supply function as $p = 14 + x$.

Determine Consumer's surplus. [10]

(b) Evaluate $\int \frac{x^3 + 2x^2}{x^2 - 3x + 2} dx$. [10]

Q.8]

(a) A shopkeeper has the facility to store a large number of a perishable item. He buys it at 30 paise per item and sells it at 50 paise. If an item is unsold at the end of the day 30 paise is lost. The daily demand for that item is given in the following table. [10]

Number of items	4	5	6
Probability	0.2	0.5	0.3

How many items should he store so that his profit is maximum?

(b) A bank has prepared a set criteria to assess the credit worthiness of potential borrowers.

A large majority, 90% of those who default do not fulfill these criteria. About 8% of good borrowers, i.e. those who will repay the loan to the bank, do not fulfill these criteria.

In general, it is known that 5% of the population is not worthy of credit. What is the risk involved to the bank in lending to a person who does not fulfill the criteria? [10]

Statistics for Management

Con. 241-15.

JO-2091

June
2015

(3 Hours)

[Total Marks : 100]

N.B.: (1) Attempt any Five questions.

(2) All questions carry equal marks.

(3) Use of non-programmable calculators is allowed.

(4) Statistical tables and graph papers will be supplied on request.

Q.1 (a) From the following data on age of employees, calculate the Karl Pearson's coefficient of skewness and comment on the results. (10)

Age(years):	20-25	25-30	30-35	35-40	40-45	45-50	50-55
Employees:	8	20	40	65	80	50	10

(b) The marks scored by Sachin and Manish in two examinations are given below (10)

Sachin:	59	50	38	89	72	69
Manish:	68	45	40	78	85	75

Using coefficient of variation decide who is more consistent in study.

Q.2. (a) Calculate Spearman's rank correlation coefficient between advertisement cost and sales from the following data: (10)

Advertisement Cost(000 Rs.):	39	65	62	90	82	75	75	25	90
Sales(Lakhs):	47	53	58	86	62	68	60	60	91

(b) The two regression lines for a certain Bivariate data are $5Y + 3X = 52$ and the regression line of X on Y is $2X + Y = 30$. Find (10)

1) means of X and Y.

2) The correlation coefficient between X and Y.

3) the most probable value of Y when X= 10.

Q.3. (a) A problem in Statistics is given to three students A, B, and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? (5)

(b) If X is the Poisson variate such that $P(X=2) = 9P(X=4) + 90P(X=6)$. Find the mean of X. (5)

(c) In a sample of 100 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find 1) How many students score between 12 and 15? 2) How many score above 18? [Given $P(0 \leq Z \leq 0.4) = 0.1554$, $P(0 \leq Z \leq 0.8) = 0.2881$, $P(0 \leq Z \leq 1.6) = 0.4452$] (10)

Q.4. (a) The following data gives the runs scored by a player during 10 test matches. Find whether the number of runs are uniformly distributed over the matches or not. (10)

Test match:	1	2	3	4	5	6	7	8	9	10
Runs:	8	8	10	9	12	8	10	14	10	11

[Given table value of chi-square at 5% l.o.s., for 9 d.f. is 16.9]

(b) The average height of 16 students is 170 cm with a standard deviation of 10 cm. Test at 5% whether the average height of the population is 172 cm or not? [given the value of t at 5% l.o.s. for 15 d.f. is 2.131] (10)

Q.5. (a) Before an increase in excise duty on tea, 400 people out of a sample of 500 persons were found to be tea drinkers. After an increase in duty, 400 people were tea drinkers in a sample of 600 people. Do you think that there is a significant decrease in the consumption of tea after the increase in the excise duty? (10)

(b) A random sample of 100 items taken from a large batch of articles contains 5 defective items

(1) Set up ^{95%}95% confidence limits for the proportion of defective items in the batch.

(2) If the batch contains 2696 items set up 95% confidence interval for the proportion of defective items.

Q.6. Three students determine the moisture content of samples of a powder, each student taking a sample from each of 4 consignments. The results are given below: (20)

Students	Consignment			
	I	II	III	IV
A	9	10	9	10
B	12	12	10	11
C	11	11	9	12

Perform an analysis of variance on these data and state whether there is any significant difference between consignments or between students. [Given Table F at 5% l.o.s. for (2,6) d.f. = 5.14 and Table F at 5% l.o.s. for (3,6) d.f. = 4.76]

Q.7. (a) What is time series. State the methods of measuring the trend in time series. Explain one of them in detail. (10)

(b) Set up control limits for "C chart" and explain the process of utilization of it. (10)

Q. 8 Write short notes on (Any 4)

(20)

- 1) Merits and demerits of measures of central tendency.
- 2) Kurtosis
- 3) Different types of Hypothesis
- 4) Scatter diagram
- 5) Binomial Distribution
- 6) Properties of Normal distribution.

— X —

**Con. 245-15. Managerial Economics
and Accounting
(3 Hours)**

JO-2246 June
2015

[Total Marks : 100]

Instructions to Candidates:-

1. In Section – I, Question Number 1 is compulsory. Attempt Any Two from the remaining four questions from Section – I. In Section – II, Question Number 1 is compulsory. Attempt Any Two from the remaining four questions from Section – II. Attempt Six Questions in all.
2. Answers to the Two Sections Should be written in the same answer book.
3. Figures to the right indicate full marks.
4. Use of calculators is permitted.

SECTION – I (MARKS: 50)

1. (a) Explain the following concepts relevant to managerial decision making: (09)
 - (i) Law of Supply
 - (ii) Income Elasticity of Demand
 - (iii) Equilibrium Price
 (b) Distinguish between the following with reference to business analysis (09)
 - (i) Derived Demand and Autonomous Demand
 - (ii) Average Product and Marginal Product
 - (iii) Average Revenue and Marginal Revenue
2. (a) Discuss the relationship between managerial economics and other disciplines (08)
 (b) Discuss with suitable examples, the significance of price elasticity of demand in managerial decision making (08)
3. (a) Bring-out the criteria of a good forecasting method. What approaches do you suggest to the problem of forecasting demand for new products (08)
 (b) The following is the price and quantity data for pens sold by a company

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Price in \$	2	1	2	4	5	4	3	8	6	5
Qty ('000 units)	9	10	8	7	5	6	8	3	4	7

Fit a linear regression line to the data and estimate the demand for pens when the price is \$ 7 per pen (08)

4. (a) Discuss the concept of internal and external economies of scale with suitable examples (08)

(b) Read the following case study on Economies of Scale and Indian Banks and answer the questions given below: (08)

Since India liberalised its economy in 1991, there was an emphasis on financial sector reforms. This was because the financial system is considered the backbone which supports the real economy. Looking at the banking industry, what India today has is a large number of commercial banks – both in public sector and private sector. The present banking structure has serious flaws with respect to high levels of non-performing assets, lack of proper risk management systems and less exposure to the global environment. In a changing dynamics of business it is imperative to create a strong banking base in India so that it can face the challenges of global trade latest expectations of the customers.

These issues have been discussed and shown concern in various committees like the Narasimham Committee, Tarapore Committee etc. In response to the present need, the government is considering merger of national banks so that big banks can be created with large deposit base. Similar trends can be seen in the private sector as well after the acquisition of certain banks. All this will lead to a banking structure with highly automated, one roof enlarged with strong fundamentals. Thus the economies of scale of the larger entities shall minimise transaction costs and shall give a chance to the industry to meet the challenges of present day trends.

Questions:

- A) *What economies of scale can be derived on account the merger policy?*
B) *How will the mergers of banks bring economies of scale?*
C) *What circumstances are forcing the government to go for bigger banks?*
5. (a) Explain with suitable examples the role of opportunity cost in managerial decision making with reference to consumption and production. (08)
- (b) Distinguish between accounting and economic profit with suitable examples with reference to decision making in a competitive business environment. (08)

SECTION – II (MARKS:50)

6. (a) Explain in brief the below concepts relevant to managerial decision making (09)
- Free entry and exit under perfect competition
 - Dumping
 - Selling costs under monopolistic competition

- (b) Distinguish between the following with reference to business analysis (09)
- (i) Cost and Price
 - (ii) Normal demand curve and kinked demand curve
 - (iii) Balance of Trade and Balance of Payments
7. (a) Explain with the help of a diagram the price and output determination of a firm earning normal profit under perfect competition in the short run (08)
- (b) Examine the case against monopoly firms in the society (08)
8. (a) Examine the salient features a firm under monopolistic market structure (08)
- (b) Write short note on patterns of behaviour of firms under oligopolistic market (08)
9. (a) Explain in brief the Innovative Theory and Risk Theory of Profit (08)
- (b) Discuss the meaning, significance and need for project planning (08)
10. (a) Explain with a suitable example the Net Present Value Method of appraising capital expenditure of projects and solve the following problem:

Vivek subscribes to 100 debentures of a company. The face value of each debenture is Rs. 100 and the annual interest rate is 15 per cent. The debentures will be redeemed at the end of three years. Find out the present value of the cash inflows for Vivek at a discounting rate of 12 per cent per annum. (08)

(b) What is the significance of break-even analysis in decision making? As per the data supplied by the Accounts Department of IDOL Ltd. the fixed costs are \$ 28,000 per year and the unit variable cost is \$ 3. The unit selling price of the product is \$10. At what level of output does the firm break-even? How much is break-even sales? If IDOL Ltd. produces and sells 3,000 units, what will be its annual profit? What is the profit at break-even point? Compute and tabulate the results (08)

Con. 251-15. Basic of Operation Research JO-2386

June
2015

I
(3 Hours)

[Total Marks : 100

- N.B. (1) Attempt any **five** questions.
 (2) All questions carry **equal** marks.
 (3) **Figures to the right** show marks to a question/sub-question.
 (4) Use of **hand held** scientific, non-programmable calculator is **allowed**.

1. (a) A farm is engaged in breeding pigs. The pigs are fed on various products grown in the farm. In view of the need to ensure certain nutrient constituents (call them X, Y and Z), it becomes necessary to buy two additional products say, A and B. One unit of product A contains 36 units of X, 3 units of Y and 20 units of Z. One unit of product B contains 6 units of X, 12 units of Y and 10 units of Z. The minimum requirement of X, Y and Z is 108 units, 36 units and 100 units respectively. Product A costs Rs.20 per unit and product B Rs.40 per unit. Formulate the above as a linear programming problem to minimize the total cost. 10

(b) A travelling salesman has to cover five cities in his tour. He has to visit the cities one by one and then return to the starting city. The travelling cost (in thousands of rupees) to each city from different cities is as given in the table below. Suggest a sequence of cities that minimizes his total cost. 10

To → From ↓	A	B	C	D	E
A	-	3	6	8	2
B	7	-	4	9	3
C	9	8	-	5	8
D	13	5	7	-	6
E	2	4	3	9	-

2. (a) Company A Ltd. has developed a sales forecasting function for its products and the products of its competitors, Company B Ltd. There are four strategies A₁, A₂, A₃ and A₄ available to company A and three strategies B₁, B₂ and B₃ to company B. The payoffs corresponding to all the twelve combinations of the strategies are given below. Considering this information, state what would be the optimal strategy for company A and company B? What is the value of the game? 10

B's Strategy

	B ₁	B ₂	B ₃
A's Strategy A ₁	30,000	-21,000	1,000
A ₂	18,000	14,000	12,000
A ₃	-6,000	28,000	4,000
A ₄	18,000	6,000	2,000

(b) Obtain the optimal solution by solving the following LPP graphically. 10
 Maximise $Z = 15X_1 + 10X_2$ Subject to the constraints:

$$4X_1 + 6X_2 \leq 360$$

$$3X_1 \leq 180$$

$$5X_2 \leq 200$$

$$\text{and } X_1, X_2 \geq 0$$

3. (a) The following information represents activities associated with a project: 10

Activities:	A	B	C	D	E	F	G	H
Precedence Activities	-	-	-	A	B	C	D,E	F,G
Optimistic time (months)	2	3	4	2	4	7	8	5
Pessimistic time (months)	4	7	8	2	8	11	16	11
Most likely time (months)	3	5	6	2	6	9	12	8

Draw the network diagram and determine the following:

- (i) Draw the PERT Network and identify the critical path
- (ii) Find expected duration and variance of the project
- (iii) Find probability that project duration will exceed 36 months
- (iv) Find the expected project duration if probability of completion is 90%

(b) Obtain the dual for the following Linear Programming Problems: 10

- | | |
|--|--|
| (i) Maximise $Z = 40X_1 + 35X_2$
Subject to $2X_1 + 3X_2 \leq 60$
$4X_1 + 3X_2 \leq 96$
$X_1, X_2 \geq 0$ | (ii) Minimise $Z = 10X_1 + 20X_2$
Subject to $3X_1 + 2X_2 \geq 18$
$X_1 + 3X_2 \geq 8$
$2X_1 - X_2 \leq 6$
$X_1, X_2 \geq 0$ |
|--|--|

4. (a) Define the following terms in reference to the Simplex Method in Linear Programming: 10

- | | |
|---------------------------------|----------------------------------|
| (i) Basic Feasible Solution | (ii) Optimal or Optimum Solution |
| (iii) Multiple Optimum Solution | (iv) Unbounded Solution |
| (v) Infeasible Solution | |

(b) A manufacturing company has four zones A, B, C, D and four sales engineers P, Q, R, S respectively for assignment. Since the zones are not equally rich in sales potential, therefore it is estimated that a particular engineer operating in a particular zone will bring the following sales;

- | | |
|--------------------|--------------------|
| Zone A : 4,20,000; | Zone B : 3,36,000; |
| Zone C : 2,94,000; | Zone D : 4,62,000 |

The engineers are having different sales ability. Working under the same conditions, their yearly sales are proportional to 14, 9, 11 and 8 respectively. The criteria of maximum expected total sales is to be met by assigning the best engineer to the richest zone, the next best to the second richest zone and so on. Find the optimum assignment and the maximum sales.

5. A particular product is manufactured in factories A, B, C and D: and is sold at centers 1, 2 and 3. The cost in Rs. of product per unit and capacity in kgms per unit time of each plant is given below: 20

Factory	Cost (Rs.) per unit	Capacity (kgms) per unit
A	12	100
B	15	20
C	11	60
D	13	80

The sale price in Rs. per unit and the demand is kgms per unit time are as follows:

Sale Centre	Sale price (Rs.) per unit	Demand (Kgms) per unit
1	15	120
2	14	140
3	16	60

Find the optimal sales distribution.

6. Using Simplex method, solve the following: 20

Minimise: $Z = 3X_1 + 4X_2$ Subject to constraints $2X_1 + 3X_2 \geq 8$
 $5X_1 + 2X_2 \geq 12$
 $X_1, X_2 \geq 0$

7. A company has been offered a contract to build and deliver nine extruding presses. The contract price negotiated is contingent upon meeting a specified delivery time with a bonus for early delivery. The company has estimated the following cost and time information for the project: 20

Activity	Normal Time (Weeks)			Normal Cost (Rs.)	Crash Time (Weeks)	Crash Cost (Rs.)
	a	B	m			
1-2	1	5	3	7000	1	9000
2-3	1	7	4	9000	3	12000
2-4	1	5	3	5000	2	8000
2-5	5	11	8	6000	7	8000
3-6	2	6	4	5000	2	6000
4-6	5	7	6	4000	4	4800
5-7	4	6	5	12000	4	14000
6-7	1	5	3	9000	1	10800

Normal Delivery time is 16 weeks for a contract price of Rs. 63000.

On the basis of the calculated profitability for each delivery time specified in the following table, what delivery schedule do you recommend that the company should implement?

Contract Delivery Time (Weeks)	Contract Amount (Rs.)
15	65000
14	68000
13	71000
12	73000

Note:

- a = optimistic time,
- b = pessimistic time,
- c = most likely time,

8. (a) An optimal Simplex table for the LPP is given below. Write down the original LPP: 10

$C_j \rightarrow$	Basis	10	6	4	0	0	0	Solution
$C_B \downarrow$	Variables	X_1	X_2	X_3	S_1	S_2	S_3	Values
6	X_2	0	1	5/6	5/3	-1/6	0	200/3
10	X_1	1	0	1/6	-2/3	1/6	0	100/3
0	S_3	0	0	4	-2	0	1	100
	$C_j - Z_j$	0	0	-8/3	-10/3	-2/3	0	

(b) The Taj Service Station has a central store where service mechanics arrive to take spare parts for the jobs they work upon. The mechanics wait in queue if necessary and are served on a "first come, first served" basis. The store is manned by one attendant who can attend 8 mechanics in an hour on an average. The arrival rate of the mechanics averages 6 per hour. Assuming that the pattern of mechanics' arrivals is poisson distributed and the servicing time is exponentially distributed, determine W_s , W_q , L_s and L_q , where the symbols carry their usual meaning. 10

II
(3 Hours)

[Total Marks : 100

- (1) Attempt any **five** questions.
- (2) All questions carry **equal** marks.
- (3) **Figures** to the **right** show marks to a question/sub-question.
- (4) Use of **hand held** scientific, non-programmable calculator is **allowed**.

1. (a) A company is trying to decide which of the two machines to purchase. Each will involve an investment of Rs. 10,000. The expected net incremental cash flows are given here. 10

Year	Machine A	Machine B
1	5,000	2,000
2	4,000	3,000
3	2,000	5,000
4	2,000	4,000

Which machine should be opted for if the money is (1) not discounted (2) discounted at the rate of 10%?

- (b) A machine operator has to perform three operations, Cutting, Milling and Drilling, on a number of different jobs. The time required to perform these operations in minutes for each job is known and is given below. 10

Machine Processing Time (min)	Job	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
	Cutting	3	12	5	2	9	11
Milling	8	6	4	6	3	1	
Drilling	13	14	9	12	8	13	

Determine the order in which these jobs should be processed in order to minimize the total time required to turn out all jobs. Also find the idle times for the three operations and the job waiting times.

2. (a) The maintenance costs and the resale price of machine A whose purchase price is INR 10000 are given as: 10

Year	1	2	3	4	5	6	7
Maintenance Cost (INR)	1500	1900	2300	2900	3600	4500	5500
Resale price (INR)	5000	2500	1250	600	400	400	400

- (i) Suggest optimal period for the replacement of the machine.
- (ii) When this machine is two years old, another machine B, a new model of machine A is available. The optimal period for replacement of this machine B is 4 years, with an average cost of INR 3600. Should we replace machine A with B? If so when?

- (b) The management of a toy factory is considering the introduction of a new type of a toy, a remote control motor bike. In the past, the management has been quite conservative in making investments in new products and considers this project quite a risky one. The management feels that the normally used required rate of return of 10% is not proper in this case and, instead, a return of 16% is expected on this project. The project, requires an outlay of Rs. 1,50,000 and has the following expected returns over its estimated life of 6 years. 10

Year:	1	2	3	4	5	6
Cash Flow ('000 Rs.)	30	30	50	60	40	25

Should the project be undertaken?

Con. 250-JO-2519-15. 2

3. (a) A machine operator has to perform two operations, milling (M_1) and grinding (M_2), on number of jobs. The time required in minutes for each of these jobs is given in the table below. 10

Job		J_1	J_2	J_3	J_4	J_5	J_6
Machine Processing Time (min)	M_1	4	14	6	3	10	12
	M_2	7	8	10	8	2	1

Determine the order in which the jobs should be processed in order to minimize the total time to complete all the jobs. In addition, find the total time to complete all the jobs. In addition, find the total processing time (cycle time), the machine idle time and the job waiting time.

- (b) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that when he starts production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for a year is Rs. 2 and the setup cost of a production run is Rs. 1,800. How frequently should production run be made? 10

4. (a) The sales of the company, in millions of rupees, are given below: 10

Year:	2007	2008	2009	2010	2011	2012	2013	2014
Sales:	82	80	90	92	83	94	99	92

Using the principle of least squares, fit a straight line trend equation to the above data. Show that the sum of deviations is equal to zero. Also determine the sum of squares of deviations. Forecast the sales for the years 2015 and 2016.

- (b) A person is considering to purchase a machine for his factory. The related data about the alternative machines are as follows: 10

	Machine A	Machine B	Machine C
Present Investment (Rs.)	10,000	12,000	15,000
Total annual cost (Rs.)	2,000	1,500	1,200
Life (years)	10	10	10
Salvage value (Rs.)	500	1,000	1,200

As an adviser of the company, you have been asked to select the best machine considering 12% normal rate of return per year.

Given: Present worth factor @12% for 10 years = 5.650

Present worth factor @ 12% for 10th year = 0.322

5. Month wise demand during January – November of a particular item is given below: 20

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Actual Demand	2000	1350	1950	1975	3100	1750	1550	1300	2200	2770	2350

(i) Forecast demand for December by taking $\alpha = 0.2$

(ii) Compute Mean Absolute Deviation (M.A.D.) and Mean Squared Error (M.S.E.) in each case and comment on selection of α

6. The management of a large hotel is considering replacement of light bulbs fitted in its rooms. There are 500 rooms in the hotel and each room uses 6 bulbs. The management is now following the policy of replacing the bulbs as they fail at a total cost of INR 3 per bulb. The management feels that this cost can be reduced to INR 1 by adopting the periodic 20

replacement method. On the basis of the information given below, evaluate the alternatives and make a recommendation to the management.

Month of Use	1	2	3	4	5
Probability of Electric bulb failure	0.1	0.15	0.25	0.3	0.2

7. For a consumer electronic products manufacturing company frequency distributions of contributions (=sales price – variable cost) per unit, annual demand and requirement of investment are as indicated below. 20

Contribution per unit (Rs.)	Relative freq.	Annual Demand (in 1000 units)	Relative freq.	Required Investment (Rs. 1000)	Relative freq.
2	0.1	15	0.05	2000	0.25
4	0.2	20	0.10	2500	0.50
6	0.4	25	0.20	3000	0.25
8	0.2	30	0.30		
10	0.1	35	0.20		
		40	0.10		
		45	0.05		

Using Monte Carlo Simulation for 20 runs estimate the percentage of return on investment (ROI%) defined as $ROI\% = \frac{\text{Cash Inflow}}{\text{Investment}} \times 100$ for each run. Use some of the variance reducing techniques during simulation. Recommend an optimum strategy.

Use the following random numbers:

17, 12, 83, 70, 90, 24, 4, 81, 75, 11, 58, 1, 3, 76, 11, 81, 74, 89, 49, 75

8. Write Short Notes; use illustrations wherever necessary. 20
- (i) Discuss the advantages and disadvantages of holding the inventory.
 - (ii) Heuristics Programming
 - (iii) Buffer & Safety Stocks
 - (iv) Assumptions of Job Sequencing

M.P. 20.09.17
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