Business Mathematics

F.Y.P.G.D.O.R.M
MAY - 2016

(3 Hours)

NC-4726

[Total Marks : 100

N.B. : (1) Attempt any **five** questions.
(2) **Figures** to **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**.

1. (a) If $a = 16$ and $b = 2^{15}$, find the value of $\dfrac{a^{5/8} b^{2/5} c^{3/7}}{\sqrt[5]{a^2 \sqrt[3]{b} \sqrt[7]{c^6}}} \times a^{1/10} b^{5/3} c^{3/7}$. 10

   (b) Find the sum of n terms of $\dfrac{1}{1.2.3} + \dfrac{3}{2.3.4} + \dfrac{5}{3.4.5} + \cdots$. 10

2. (a) Find the equation of a circle passing through A(-6, 5), B(-3, -4) and C(2, 1) 10
   what are its centre and radius ?

   (b) A manufacturer produce 3 products p_1, p_2 and p_3 whose profits per unit are Rs. 5, 10
   Rs. 7 and Rs. 10 respectively. There products require processing through 3 machines.
   Time in hour, for processing through each machine for each products and the total
   machine time, in hour, available are given in the following table :—

Product Machine	p_1	p_2	p_3	Total machine hours
M_1	2	6	4	380
M_2	6	5	5	470
M_3	2	4	3	280

   Find the number of units of each product to be produced so that all the machine
   time available will be fully utilized and also the total profit earned.

3. (a) A firm produces 600 units in the 3rd year of its existence and 700 units in its 10
   7th year. Assuming that the production grows in A.P. Find its production in the
   (i) first year, (ii) 10th year and (iii) the total production in the first 8 years.

   (b) Show that $\left(5 + \sqrt{21}\right)^{3/2} + \left(5 - \sqrt{21}\right)^{3/2} = 8\sqrt{14}$. 10

4. (a) Obtain an equation of a circle passing through the origin and having intercepts 3 10
   and 4 on x-axis and y-axis respectively. Also find radius and center of circle.

   (b) In a general aptitude test which consisted of 3 parts : Part I-Quantitative comparisons, 10
   Pat-II Logical reasoning, Part III-Reading comprehension, the number of participants
   were 3000, only 2270 participants were able to get through Part-I, 750 through
   Part-I and Part-II, 450 throuogh Part-II and Part-III, 1000 through Part-I and Part-III
   and 400 through all the parts. There were 260 participants who get through Part-II
   alone but not the other two and 1200 passed in Part-III.
   (i) How many were in a position to get through Part-II ?
   (ii) How many failed in all the three parts ?
   (iii) How many got through only Part-I ?

[TURN OVER

5. (a) Unit sales of product are forecast according to the following relationship. $s = 4000 - 50p$ **10** and the total cost function is $c = 20000 - 20s$. If the product is sold in two regions one of which imposes Rs. 2 per unit tax on the manufacturer whereas the other region has no tax, what prices should be charges in each region in order to maximize the profits ?

   (b) Solve the following :— **10**

   (i) $\displaystyle\lim_{x \to 0} \frac{10^x + 7^x - 14^x - 5^x}{\left(8^x - 1\right)^2}$

   (ii) $\displaystyle\lim_{x \to 1} \frac{x + 3x^2 + 5x^3 + \cdots + (2n-1)x^n - n^2}{x - 1}$

6. (a) Find the area of the region included between the parabola $y = x^2 + 1$ and the **10** line $y = 2x + 1$.

   (b) A problem is given to the three students Sumit, Amit and Akbar whose chances of **10** solving it are $\dfrac{1}{2}, \dfrac{1}{3}$ and $\dfrac{1}{4}$ respectively. If they attempt to solve a problem independently, find the probability that (i) the problem is solved by each of them (ii) the problem is not solved by any of them (iii) the problem is solved by at least one of them.

7. (a) Determine the rank of matrix by reducing it to row echelon form. **10**

   $$A = \begin{bmatrix} 20 & 24 & 27 & 30 \\ 5 & 20 & 16 & 15 \\ 20 & 27 & 24 & 5 \end{bmatrix}$$

   (b) If $y = 25 + 6x - 2x^3$, find maximum and minimum values of y. **10**

8. (a) The probability that 1 percent of the items produced by a certain process are defective **10** is 80. The probability that 5 percent of the items are defective is 10. And the probability that 10 percent are defective is 0. An item is randomly chosen, and it is found to be defective. What is the probability that 1 percent of the item are defective ? that 5 percent are defective ? that 10 percent are defective ? Suppose that the second item is randomly chosen from the output the process, and it 100 is defective. Following that second observation. What are the probabilities that 1, 5 and 10 percent, respectively, or the items produced by the process are defective ?

   (b) Using inversion method, solve the following simultaneous equations. **10**
   $$2x_1 - x_2 - x_3 = 4, \quad 3x_1 + 4x_2 - 2x_3 = 11, \quad 3x_1 - 2x_2 + 4x_3 = 11.$$

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F.Y.P.G.D.O.R.M
MAY - 2016

Con. 2M-16.

Statistics for management

NC-4824 June 2016

(3 Hours) **[Total Marks : 100**

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

(2) All questions carry equal marks.

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

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

Q.1 (a) Obtain Karl Pearson's coefficient of skewness for the following data.

C.I	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency.	6	8	17	21	15	11	2

(10)

(b) Goals scored by two teams A and B in a football season were as follows:

No. of Goals scored In a match	No. of matches (A)	No. of matches (B)
0	27	17
1	9	9
2	8	6
3	5	5
4	4	3

Using coefficient of variation decide which team is more consistent in scoring the goals. (10)

Q.2 (a) Calculate Karl Pearson's Product moment coefficient of correlation between the variables X and Y, for the following data. (10)

X	20	23	25	35	42	28	50	44	39	30
Y	12	14	15	16	16	17	18	15	17	13

(b) The following data pertain to the marks in subjects A and B in a certain examination:

Mean marks in A = 39.5

Mean marks in B = 47.5

Standard deviation of marks in A = 10.8

Standard deviation of marks in B = 16.8

Coefficient of Correlation between marks in A and Marks in B = 0.42

Construct the two regression equations and estimate the marks in B for the candidate who secured 50 marks in A. (10)

Q.3 (a) For a wholesale electrical warehouse, past sales record show that average of daily sales for a certain type of transformer is 5 units. Demand for this type of transformer has a Poisson distribution. Find out the probabilities for 0,1,2,3,4 units demand. (e^{-5} = 0.00674) (7)

(b) Probability that the student appearing for certain competitive examination passes the exam is 0.2. If 7 students appearing for this exam are selected at random, find the probability that the number of students passing the exam is (i) 2, (ii) 4, (iii) all, (iv) None (v) at least one . (7)

(c) Of a large group of men, 5% are under 60 inches and 40% are between 60 and 65 inches. Assuming a normal distribution, find the mean height and standard deviation. (6)

Q.4 (a) Eight coins were tossed 256 times and the following results were obtained.

③

[TURN OVER

Number of heads	0	1	2	3	4	5	6	7	8
Frequency	2	6	30	52	67	56	32	10	1

Using χ^2 test decide whether the coins are biased, given that the table χ^2 value for 8 degrees of freedom at 5% level of significance is 15.507.   (10)

(b) The average length of 10 rods taken from a lot with S.D.=5cm,worked out to 200 cm. Does this indicate a significant difference from the specified average of 205 cm? Given that the t value at 5% level of significance for 9 degrees of freedom is 2.262.   (10)

Q.5 (a) A certain process produces 10 percent defective articles. A supplier of new raw material claims that the use of his material would reduce the proportion of defectives. A random sample of 400 units using this new material was taken out of which 34 were defective units. Can the supplier's claim be accepted? Test at 1 % level of significance.   (10)

(b) A random sample of 150 items taken from a large batch of articles contains 9 defective items.
   1) set up 95% confidence limits for the proportion of defective items in the batch.
   2) If the batch contains 2500 items, set up 95% confidence interval for the proportion of defective items.   (10)

Q.6   The following table gives the monthly sales(in thousand Rupees) of a certain firm in three states by its four salesmen:

States	Salesmen			
	A	B	C	D
X	5	4	4	7
Y	7	8	5	4
Z	9	6	6	7

Set up an analysis of variance table for the above information. State whether the difference between sales affected by the four salesmen and the difference between sales affected in the the three states are significant.   (20)

Q.7 (a) The following table gives the demand, in thousands of rupees, for an assembly part in a period of one year.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Demand	28	27	31	33	33	32	35	37	36	35	40	39

(i) determine the linear trend by least square method.

(ii) What will be the estimated demand in the months of January and February of the next year?
                                                                                                        (10)

(b) Blisters, pit marks, anode burns and sand blasting marks on front bumper were checked for 20 pieces. Total number of defects on them were as follows:

④

Item No	1	2	3	4	5	6	7	8	9	10
Total No. of Defects	2	0	4	1	0	8	0	1	2	0
Item No	11	12	13	14	15	16	17	18	19	20
Total No. of Defects	6	0	2	1	0	3	2	1	0	2

Carry out suitable chart analysis and devise a suitable control scheme for future.   (10)

Q.8 Write short Notes on the followings (Any Four).   (20)

    1) Various stages in sample Survey

    2) Coefficient of correlation and Scatter diagram

    3) Properties of normal distribution

    4) Hyper-geometric distribution

    5) Type I and Type II errors

    6) Components of time series

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Managerial economics & accounting

TIME: 03 HOURS　　　　　　　　　　　　　　MAX.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 6 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 are to be written in the Same Answer Book

3. Figures to the right indicate full marks

4. Use of calculator is permitted

SECTION – I (MARKS:50)

1. (a) Explain in brief the following concepts relevant to managerial decision making:
    　　　　　　　　　　　　　　　　　　　　　　　　　　　　(09)

    (i)　　Law of Supply
    (ii)　　Income Elasticity of Demand
    (iii)　Revenue function

    (b) Distinguish between the following:　　　　　　　　　　(09)

    (i)　　Firm Demand and Industry Demand
    (ii)　　Short Run and Long Run Production Function
    (iii)　Marginal Revenue and Total Revenue

2. (a) Discuss the functions of managerial economist with examples in the context competitive business environment　　　　　　　　　(08)
    (b) Discuss with suitable examples, the applications of elasticity of demand in business decision making　　　　　　　　　　　　　　(08)

3. (a) Why is demand forecasting important for business decisions? Explain in brief the various types of survey methods of demand forecasting　　(08)

    (b) Below are given the figures of demand for cereals (in thousand tonnes) for a particular region

Year	1999	2000	2001	2002	2003	2004	2005
Demand in '000 units	77	88	94	85	91	98	90

    (i)　　Fit a trend line

[TURN OVER

(ii)   What is the monthly increase in demand?

(iii)   What should be the demand for cereals in the year 2012?

                                                               (08)

4. (a) Define Economies of Scale. Explain with examples the external economies of scale in managerial decision making   (08)

(b) Read the following case study on Law of Variable Proportions and answer the questions given below: (08)

Donald K Brown and Company operates a pearl diving operation in the North Pacific Ocean. Mr. Brown owns a large trawler and hires local divers from the nearby islands and pays them on the basis of weight of oysters recovered. He sells the pearls and the oyster meat separately. Over the past month he has been out pearling eight times in the same general area, taking all the divers who showed up for each trip.
The particulars are as follows:

Trip Number	Divers employed	Oysters Recovered(Kgs.)
1	6	38
2	17	76
3	9	56
4	5	32
5	12	74
6	3	15
7	14	80
8	15	78

Questions:
A) Over what ranges do these appear to be increasing, constant and diminishing returns o the variable factor?
B) What numbers of divers appear to be most efficient in terms of output per diver?
C) What numbers of divers appear to be most efficient in terms of the utilisation of trawler and other equipments?

5. (a) Explain with suitable examples the role of Learning Cost in managerial decision making with reference to production.   (08)

(b) Distinguish between normal profit and super normal profit with suitable examples with reference to decision making by a business firm   (08)

SECTION – II (MARKS:50)

6. (a) Explain in brief the below concepts relevant to managerial decision making   (09)
    (i)   Product homogeneity under oligopoly
    (ii)   Perfectly elastic demand curve under perfect competition
    (iii)   Selling costs under monopolistic competition

(b) Distinguish between the following with reference to business analysis   (09)

    (i)   Short run and long run period
    (ii)   Debt capital and equity capital
    (iii) Recession and recovery phases of a business cycle

7. (a) Explain with the help of a diagram the price and output determination of a firm earning normal profits under perfect competition in the short run period   (08)

    (b) What are the objectives of price discrimination? Explain briefly the case of dumping as a special case of price discrimination   (08)

8. (a) What are selling costs? Discuss briefly the significance of advertising costs in the promotion of sales with the help of a suitable diagram to a monopolistic firm   (08)

    (b) Write short note on kinked demand curve with reference to the oligopolistic market   (08)

9. (a) What is depreciation? What are the methods of computing depreciation? Explain any one method with a suitable example   (08)

    (b) Define and discuss the meaning and need for project planning for a business firm in a competitive market   (08)

10. (a) Compute (i) breakeven point in units and $, (ii) contribution margin at BEP, (iii) number of units to be sold to earn a profit of $72,000 and (iv) margin of safety using original data in Following is the contribution margin income statement of a single product company: (08)

	Total	Per unit
Sales	$24, 00,000	$160
Less variable expenses	$ 16, 80,000	$ 112
Contribution margin	7, 20,000	48
Less fixed costs	6, 00.000	
Net operating income	$120,000	

(b) Explain the Pay Back Period Method of appraising capital expenditure of projects and solving the following problem state which project will be chosen?

Year	0	1	2	3	4	5
Cashflowof Project A (In Rs Lac)	500,000	100,000	115,000	125,000	160,0000	200,000
Cashflowof Project B (In Rs Lac)	- 500,000	140,000	160,00	200,000	170,000	100,000

                           (08)

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(3 Hours)   [Total Marks : 100

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

(2) **Figures** to the **right** indicates marks to a Question/Sub-question.

(3) Use of **scientific handheld, non programmable** calculator is **allowed**.

(4) **Graph Paper** will be supplied on **Request**.

1. (a) A firm manufactures headache pills in two sizes A and B. Size A contains 2 grains of   **10**
   aspirin, 5 grains of bicarbonate and I gcodeine Size B contains 1 grain of aspirin, 8
   grains of bicarbonate and 6 grains of codeine. It is found by users that it requires at least
   12 grains of aspirin, 74 grains of bicarbonate and 24 grains of codeine for providing immediate
   effect. It is required to determine the least number of pills a patient should take to get immediate
   relief. Formulate the problem as a standard LPP.
   DO NOT SOLVE IT.

   (b) A small assembly plant assembles PCs through 9 interlinked stages according to the following   **10**
   precedence :

Stage from-to	Duration (hours)	Stage from-to	Duration (hours)
1-2	4	4-6	10
1-3	12	5-7	10
1-4	10	6-7	0
2-4	8	6-8	8
2-5	6	7-8	10
3-6	8	8-9	6

   (i) Draw an arrow diagram representing above assembly work.

   (ii) Tabulate Earliest Start, Earliest Finish, Latest Start and Latest Finish times for all
   the stages.

   (iii) Find the critical path and the assembly duration.

   (iv) Calculate Total float, Free float and Independent float.

2. (a) Obtain the optimal strategies for both the players and the value of the game for zero-sum   **10**
   two-person game whose payoff matrix is as follows :

A's Stategies	B' s Strategies	
	B1	B2
Al	1	–3
A2	3	5
A3	–1	6
A4	4	1
A5	2	2
A6	–5	0

   (b) A salesman is planning to tour cities A, B, C, D and E starting from his home city.   **10**
   The inter-city, distances are shown in the following table.

City	A	B	C	D	E
A	–	103	103	188	38
B	103	–	262	176	52
C	188	262	–	35	275
D	136	176	85	–	162
E	38	52	275	162	–

   Solve this Travelling Salesman's Problem if he is not going to visit the same city again.

   [**TURN OVER**

3. (a) Solve the following LPP Graphically :   **10**
        Maximise $Z = 4x_1 + 3x_2$
        Subject to the constraints :
        $$2x_1 + x_2 \leq 1,000$$
        $$x_1 + x_2 \leq 800$$
        $$x_1 > 0 \text{ and } x_2 \geq 0$$

    (b) Distinguish between the following :   **10**
        (i) CPM and PERT
        (ii) Transporation problem and Assignment Problem.

4. (a) Find the dual of the following LPP :   **10**
        Maximise $Z = X_1 + X_2 + 7X_3$
        Subject to the constraints :
        $$X_1 + X_2 + X_3 = 10$$
        $$5X_1 - X_2 + X_3 \geq 12$$
        $$X_1 + 7X_2 - 3X_3 < 4$$
        $$X_1, X_2, X_3 \geq 0$$

    (b) The following table gives the transportation cost from 3 origins to 4 destinations and the   **10**
        availability at the origin and the requirement at the destination.

Origin	Destination				
	1	2	3	4	Availability
1	6	1	9	3	70
2	11	5	2	8	55
3	10	12	4	7	90
Requirement	85	35	50	45	

Given $X_{13} = 50$ units, $X_{14} = 20$ units, $X_{21} = 55$ units, $X_{31} = 30$ units, $X_{32} = 35$ units and $X_{34} = 25$ units. Is it an optimal solution to the transportation problem ? If not modify it to obtain a better feasible solution.

5. Parul Corporation has four plants each of which can manufacture anyone of four products.   **20**
    Production costs differ from one plant to another as do Sales Revenue. Given the Revenue
    and Cost data below, obtain which product each plant should produce to maximise profit :

Plant	Sales Revenue (₹ '000s) Product				Production Cost (₹ '000s) Product			
	1	2	3	4	1	2	3	4
A	50	68	49	62	49	60	45	61
B	60	70	51	74	55	63	45	69
C	55	67	53	60	52	62	49	58
D	58	65	54	69	55	64	48	66

6. Use penalty (or Big M) method to   **20**
        Maximize $z = 6x_1 + 4x_2$
        subject to the constraints :
        $$2x_1 + 3x_2 \leq 30$$
        $$3x_1 + 2x_2 \leq 24$$
        $$x_1 + x_2 \geq 3$$
        $$x_1 \geq 0 \text{ and } x_2 \geq 0$$
    Is the solution unique? If not, give two different solutions.

7. As the Project Manager of Quick Construction Company, you are involved in drawing a PERT   **20** network for laying the foundation of a new art museum. The relevant information for all the activities of this project is given in the following table :

Activity	Time estimated (in weeks)			Normal cost for expected Duration (₹in 000's)	Crash Cost (₹) (₹in 000's)	Immediate Predecessor/s
	t_0	t_m	t_p			
A	2	3	4	6,000	8,000	—
B	4	5	6	12,000	13,500	A
C	3	5	7	16,000	22,000	A
D	2	4	6	8,000	10,000	A
E	1	2	3	6,000	7,500	C.D.
F	1	3	5	14,000	20,000	B.E

    (i) Construct the PERT network for the project and determine the Critical Path and the Expected Duration of the project.

   (ii) The director of your company is not impressed by your PERT analysis. He draws your attention that the project must be completed by seven weeks and refers to the penalty clause in the agreement which provides for Penalty @ ₹ 25,00,000 for every week or part thereof exceeding 7 weeks. Your director also strongly believes that the time duration of various activities of the project can be crashed to their Optimistic Time estimates with the crashing Costs mentioned in the above table. Determine the optimum duration of the project if your objective is to minimise the sum of the project execution Cost and the Penalty Cost.

8. (a) The final tableau of Simplex Algorithm is as follows :.   **10**
       Find the original problem.

		C_j	900	1200	0	0
C_b	Basic variables	Solution Values	X_1	X_2	S_1	S_2
1200	X_2	1/3	0	1	1/12	–1/30
900	X_1	7/3	1	0	–1/20	1/15
	Z_j	2500	900	1200	55	20
	$C_j–Z_j$		0	0	–55	–20

 (b) The rate of arrival of customers at a public telephone booth follows Poisson distribution **10** with an average time of 10 minutes between one customer and the next. The duration of a phone call is assumed to follow exponential distribution with mean time of 3 minutes.

    (i) What is the probability that a person arriving at the booth will have to wait ?

   (ii) What is the average length of the non-empty queues that form from time to time ?

  (iii) The Mahanagar Telephone Nigam Ltd. will install a second booth when it is convinced that the customers would expect waiting for at least 3 minutes for their turn to make a call. By how much time should the flow of customers increase in order to justify a second booth ?

  (iv) Estimate the fraction of a day that the phone will be in use.

  (v) What is the probability that it will take him more than 10 minutes altogether to wait for phone and complete his call ?

<div align="center">********</div>

<div align="center">(11)</div>

F.Y.P.G.D.O.R.M
MAY - 2016

(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 handheld **scientific, non-programmable** calculator is **allowed**.
   (5) **Graph** paper will be **provided** on **request**.

1. (a) The following data gives the number of T.V. tubes produced by a certain manufacturer.   **10**
      Using the principle of Least Squares, fit a Straight Line Trend equation. Also find
      the Expected production for the year 2016.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
T.V. tubes (in 1000)	15	17	20	25	30	31	30	32	34

   (b) Five jobs are to go through three machines M1, M2 and M3 in the same order. From   **10**
      the time schedule given in each of the following cases, Solve for the Minimum
      Elapsed Time and Idle Time for each machine.

Jobs	A	B	C	D	E
Machine M1	3	2	4	1	8
Machine M2	5	3	2	4	1
Machine M3	6	5	6	7	5

2. (a) A dentist schedules all his patients for 30 minutes appointments. Some of the   **10**
      patients take more or less than 30 minutes depending on the type of dental work
      to be done. The following summary shows the various categories of work, their
      probabilities and time actually needed to complete the work :

Category of service	Time required (Minutes)	Probability of Category
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Checkup	15	0.20

[TURN OVER

Simulate the Dentist's clinic for 4 hours and determine the average waiting time for the patients as well as the Idle time for the Doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8 am. Use the following Random Numbers for handling the above problem :

40   82   11   34   25   66   17   79.

(b) The Initial Cost of an item is Rs. 15,000 and the Running costs for different years are given below :   **10**

Year	1	2	3	4	5	6	7
Running costs (Rs)	2500	3000	4000	5000	6500	8000	10000

What is the best replacement policy if capital is worth 10% and there is no salvage value ?

3. (a) A company is considering the purchase of a new grinder which will cost Rs. 10,000.   **10**
The economic life of the machine is expected to be 6 years. The salvage value of the machine will be Rs. 2,000. The average operating and maintenance costs are estimated to be Rs. 5,000 per annum.
   (i) Assuming an interest rate of 10%, determine the present value of future costs of the proposed grinder.
   (ii) Compare this grinder with the presently owned grinder that has an annual operating cost of Rs. 4,000 per annum and expected maintenance cost of Rs. 2,000 in the second year with an annual increase of Rs. 1,000 thereafter. The operating and the maintenance costs are incurred at the Beginning of the time period.

(b) A product is sold at the rate of 50 pieces per day and is manufactured at a rate of   **10**
250 pieces per day. The setup cost of the machines is Rs. 1,000 and the storage cost is found to be Rs. 0.0015 per piece per day. With labour charges of Rs. 3.20 per piece, material cost at Rs. 2.10 per piece and overhead cost of Rs. 4.10 per piece, find the minimum cost batch size if the interest charges are 8% (Assume 300 working days in a year). Compute the optimal number of cycles required in a year for the manufacture of this product.

(13)

4. (a) Solve the following problem for Minimum Elapsed Time, given that, Job C is to   **10**
be taken up last.

Jobs	A	B	C	D	E
Machine M1	4	3	1	2	6
Machine M2	5	6	5	4	3

(b) A manufacture has to supply to his customers 600 units of his product per year.   **10**
Shortages are not allowed and the Storage Cost amounts to Rs. 0.6 per unit per
year. The setup cost per run is Rs. 80. Find the optimum run size and the minimum
yearly cost.

5. From the following values prepare forecast by the method of exponential smoothing   **20**
taking initial estimates as 100, the value of $\alpha = 0 \cdot 4$ and initial trend value zero :

Time period (t)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Actual value (X)	104	108	118	115	120	122	123	125	128	130

6. Observations of a past data show the following patterns in respect of interarrival durations   **20**
and service durations in a single channel queuing system. Simulate the queue behaviour
for a period of 60 minutes and estimate the probability of the service being idle and
the mean time spent by the customer waiting for service.

Interarrival Time		Service Time	
Minutes	Probability	Minutes	Probability
2	0.15	1	0.10
4	0.23	3	0.22
6	0.35	5	0.35
8	0.17	7	0.23
10	0.10	9	0.10

[TURN OVER

Use the following Random numbers in a pair (93,14), (72,10) (21,81) and so on for (inter arrival time, service time) respectively.

93	14	72	10	21
81	87	90	38	10
29	17	11	68	99
51	40	30	52	71

7. The following has been observed for certain type of light bulbs : **20**

Week	1	2	3	4	5
Percent failing by the end of the week	10	25	50	80	100

There are 1000 bulbs in use and it costs Rs. 20 to replace an individual bulb which has burnt out. If all bulbs are replaced simultaneously it would cost Rs. 5 per bulb. Obtain the Best replacement policy.

8. Write short notes on any **two** of the following :— **20**
   (a)   The objectives of an Inventory control
   (b)   Heuristic Programming
   (c)   Shortage Cost
   (d)   Assumptions of job sequencing.

F.Y.P.G.O.O.R+M

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