P4–Exam.–2018-1–36

Con. 361–18.

TN–6176

(3 Hours)

[**Total Marks : 100**

Aug 2018

N.B. (1) Attempt any **Five** questions.
  (2) **Figures** to the **right** indicate **full** marks to a question.
  (3) **Graph paper** will be supplied on **request**.
  (4) Scientific **non-programmable** handheld calculator is **allowed**.

Q.1 (a) A tank can fill by the taps in 8 hours and can be emptied by the other taps in hours. How long **20** will it take to fill the tank if both the taps are opened together ?

  (b) In a town there are 4 crossroads with traffic lights. Each traffic light opens or closes the traffic with the same probability of 0.5. Determine the probability of –
    (i) a car crossing the first crossroad without stopping
    (ii) a car crossing first two crossroads without stopping
    (iii) a car crossing all the crossroads (4) without stopping.

Q.2 (a) A watch was sold at a loss of 9%. Its was observed that if the selling price was Rs. 420/- **20** more, then the profit made would have been 5%. What is the actual selling price of the watch?

  (b) A ball is kicked at an angle of 35° with the ground.
    (i) What should be the initial velocity of the ball so that it hits a target that is 30 meters away at a height of 1.8 meters ?
    (ii) What is the time for the ball to reach the target ?

Q.3 (a) Simplify : $\left[\left(\dfrac{1}{a^2}+\dfrac{1}{b^2}\right)\dfrac{1}{a^2+2ab+b^2}+\dfrac{2}{(a+b)^3}\left(\dfrac{1}{a}+\dfrac{1}{b}\right)\right]\dfrac{a-b}{a^3b^3}$ **20**

  (b) Find the limit of : $\displaystyle\lim_{x\to\infty}\dfrac{1}{\sqrt{x+1}-\sqrt{x-1}}$

Q.4 (a) Using the properties of determinants prove that : **20**

$$\begin{vmatrix} x^2+1 & xy & xz \\ xy & y^2+1 & yz \\ xz & yz & z^2+1 \end{vmatrix} = 1+x^2+y^2+z^2$$

  (b) There are b boys in the class. This is three more than four times the number of girls. How many girls are in the class ?

①

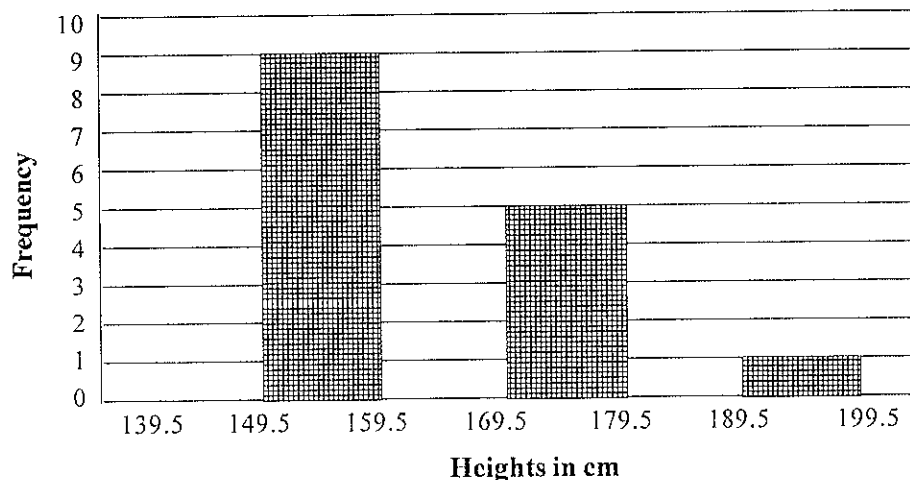**[TURN OVER**

Q.5 (a) The histogram below shows the heights (in cm) distribution of 30 people. **20**
   (i) How many people have heights between 159.5 and 169.5 cm ?
   (ii) How many people have heights less than 159.5 cm ?
   (iii) How many people have heights more than 169.5 cm ?
   (iv) What percentage of people have heights between 149.5 and 179.5 cm ?

Heights of 30 people

Heights in cm

(b) Find the rank of the matrix :

$$A = \begin{pmatrix} 1 & 2 & 1 & -1 \\ 9 & 5 & 2 & 2 \\ 7 & 1 & 0 & 4 \end{pmatrix}$$

Q.6 (a) Find the area of the region enclosed by the graphs of $y = \left[x\left(\sqrt{x+1}\right) \right]$ & $y = 2x$ **20**

(b) A faucet is turned on and water flows out at a rate of

$$v(t) = t^3 - \frac{1}{2}t^2 + 4$$

gallons per minute, where t is the number of minutes since the faucet was turned on. To the nearest gallon, how much water flows out of the faucet during the first two minutes the faucet is turned on ?

Q.7 (a) A box is filled with candies in different colors. We have 40 white candies 24, green ones, **20** 12 red ones, 24 yellow ones and 20 blue ones. If we have selected one candy from the box without peeking into it, find the probability of getting a green or red candy.

(b) In a parking place, there are 200 vehicles, 90 of which are lorries, 50 are cars and the rest are vans. If every vehicle is equally likely to leave, find probability of van leaving first.

Q.8 (a) Find the geometric are a of the following functions on the corresponding interval **20** f(x) = 6 – 3 x 2 on [0, 2]

(b) A tree is supported by a wire anchored in the ground 5 feet from its base. The wire is 1 foot longer than the height that it reaches on the tree. Find the length of the wire.

F·Y·P·G·D·O·R·M· = paper- II

Aug:-2018

(Statistics for. Manag

Con. 346–TN–6139–18.   2

    (b) A random sample of 8 envelops is taken from letter box of a post office and their weights in grams

      Are found to be 12.1 11.9 12.4 12.3 11.9 12.1 12.4 12.1

        (i)   Find 99% confidence limits for the mean weight of the envelops received at the post office.

        (ii)   Test the hypothesis at 1% level of significance that the average weight of envelops received at that post office is 12.35 gms.

Q.5 (a) The means of two large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population with standard deviation 2.5 inches? (test at 1% level of significance)

     (b) In a sample of 1000 people in Maharashtra 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat eaters are equally popular in this state at 1% level of significance.

Q.6 The following data refer to yield of a certain crop, in quintals, under four different conditions : Prepare ANOVA table. Can we conclude that the treatments are equally effective producing the crops?

Treatment	Yield in quintals				
A	24	30	28	26	
B	32	34	31	29	35
C	40	35	41	38	
D	19	27	28	22	23

Q.7 (a) Define time series with example. State the components of time series and also explain any one method of measuring the trend .

     (b) Number of defects observed in ten successive items are as below :

       2,   3,   3,   1,   0,   5,   0,   0,   8,   1

     Draw the C-Chart and comment on the same.

Q.8 Write short notes on any **Five** :

      (a)   Binomial distribution

      (b)   Measures of dispersion

      (c)   Kurtosis and measures of kurtosis

      (d)   Errors in testing of hypothesis

      (e)   Combined mean and combined standard deviation

      (f)   Properties of Normal distribution

      (g)   Scatter diagram

③

(3 Hours) [Total Marks : 100

N.B. (1) Attempt any **Five** questions.
(3) ,**All** questions carry **equal** marks.
(4) Use of **non-programmable** calculator is allowed.
(5) **Statistical tables** and **graph papers** will be supplied on **request**.

Q.1 (a) Find the Bowley's Coefficient of skewness for the following data :

Class limits	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Frequency	5	9	14	20	25	15	8	4

(b) Prices of a particular commodity in five years in two regions are given below :

Region A	20	22	19	23	16
Region B	10	20	18	12	15

Examine in which region the price is more and consistent.

Q.2 (a) Calculate the Karl Pearson's Correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y) :

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(b) In partially destroyed laboratory record of an analysis of correlation data, the following results only are legible.
Variance of X= 9
Regression equations. 8X-10Y +66 = 0, 40X-18Y-214 = 0
What were (i) mean values of X and Y,
(ii) correlation coefficient between X and Y,
(iii) standard deviation of Y.

Q.3 (a) If X is random variable following Binomial distribution with mean 2.4 and variance 1.44. Find P (X > 5), and P (1 < X < 4).

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

(c) The distribution of marks obtained by a group of 1000 students in a subject, may be assumed to be normal with mean 50 and standard deviation 5 marks. Estimate 1) the proportion of students securing marks between 45 and 60, 2) the number of students expected to score 60 or more marks.

Q.4 (a) 250 digits were chosen from a set of tables. The frequencies of the digits were -

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use chi square test to check the hypothesis that the digits were distributed uniformly. (Given table value of chi square for 9 degrees of freedom is 16.9.

[TURN OVER

(3 Hours) [Total Marks : 100

N.B. : (1) In **Section I** Question No.1 is **compulsory**. Attempt any **two** questions from the remaining **four** questions from **Section I**. In **Section II** Question No. 6 is **compulsory**. Attempt any **two** questions from the remaining **four** questions from **Section II**. Attempt any **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 marks.
(4) Use of **calculator** is **permitted**.

Section I (Marks : 50)

1. (a) Explain in brief the following concepts relevant to managerial decision making :   **9**
    (i) Law of diminishing marginal utility
    (ii) Price Elasticity of Demand
    (iii) Marginal Product.
   (b) Deistinguish between the following :–   **9**
    (i) Perfect competition and Monopoly
    (ii) Short Run and Long Run cost Function
    (iii) Marginal Revenue and Incremental Revenue.

2. (a) Discuss the responsibilities of managerial economist with examples in the context   **8** of competitive business environment.
   (b) Discuss with suitable examples, the applications of cross elasticity of demand   **8** in business decision making.

3. (a) Why is demand forecasting important for business decisions ? Explain in brief   **8** the various types of statistical methods of demand forecasting.
   (b) Below are given the figures of demand for cereals (in thousand tonnes) for a particular   **8** 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.
    (ii) What is the monthly increase in demand ?
    (iii) What should be the demand for cereals in the year 2012 ?

4. (a) Define Economics of Scale. Explain with examples the external economics of   **8** scale in managerial decision making.
   (b) Read the following case study on Law of Veriable Proportions and answer the   **8** question given below :

[TURN OVER

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

Question :
    (i) Over what ranges do these appear to be increasing constant and diminishing returns to the variable factor ?
    (ii) What numbers of divers appear to be most efficient in terms of output per diver ?
    (iii) What numbers of divers appear to be most efficient in terms of the utilisation of trawler and other equipment ?

5. (a) Explain with suitable diagram the significance of average and marginal cost in managerial decision making with reference to production.   8
   (b) Distinguish between economic cost and economic profit with suitable examples with reference to decision making by a business firm.   8

Section II (Marks : 50)

6. (a) Explain in brief the below concepts relevant to managerial decision making :   9
    (i) Oligopoloistic market
    (ii) Average Revenue and Marginal Revenue under Monopoly
    (iii) Selling costs under monopolistic competition.
   (b) Distinguish between the following with reference to business analysis :   9
    (i) Short run and long period production function.
    (ii) Debt capital and equity capital.
    (iii) Recession and recovery phases of a business cycle.

(6)

7. (a) Explain with the help of a diagram the price and output determination of a firm   8
earning normal profits under perfect copetition in the short run period.

(b) What are the objectives of price discrimination ? Explain briefly the case of dumping   8
as a special case of price discrimination.

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

(b) Write short note on kinked demand curve with reference to the oligopolistic market.   8

9. (a) What is depreciation ? What are the methods of computing depreciation ? Explain   8
any one method with a suitable example.

(b) Define and discuss the meaning and need for capital budgeting for a business firm   8
in a competitive market.

10. (a) Compute :   8
    (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 sefety using original data in following is the contribution margin
    income statement of a single product company :

	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) Bring out the need for investment criteria in business decision making. Examine   8
the relative superiority of net present value method over pay back period method
of investment criteria.
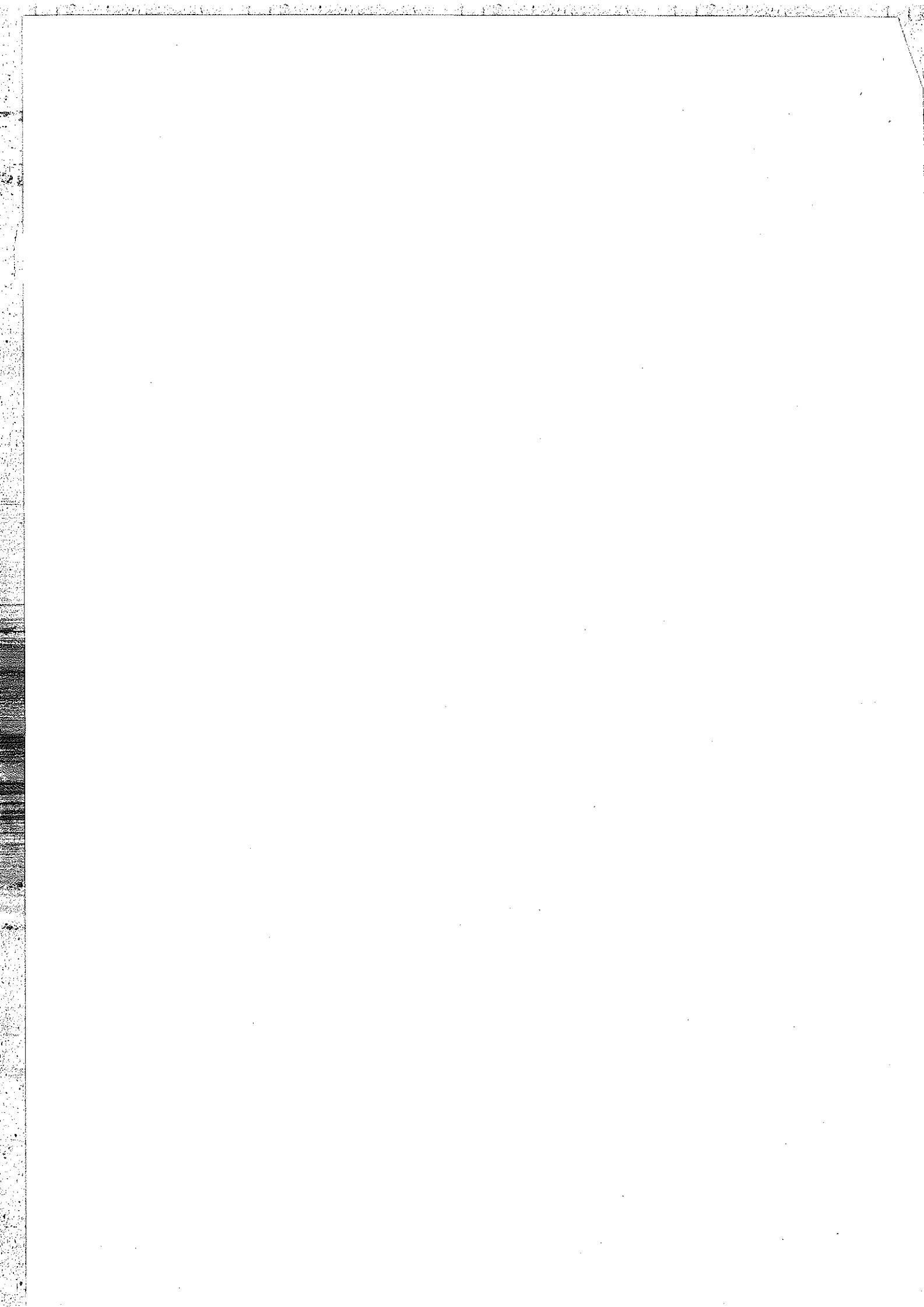
Con. 326–18.   TN–6772

(3 Hours)   [Total Marks : 100

N.B. : (1) Attempt any **five** questions.
  (2) **All** questions carry **equal** marks.
  (3) **Figures** to the **right** indicates marks to the question/sub-question.
  (4) **Graph Paper** will be supplied on **request**.
  (5) Use of Scientific, Hand held, Non-programmable calculator is **allowed**.

1. (a) Draw a network diagram from the following activities. Find the critical Path.   10
        Find the Duration of the Critical Path. Also find the
          (i) Earliest Start Time
          (ii) Earliest Finish Time
          (iii) Latest Start Time
          (iv) Latest Finish Time
          (v) Total Float for each activity.

Job	Immediate Predecessor/s	Job Time (in days)
A	—	13
B	A	8
C	B	10
D	C	9
E	B	11
F	E	10
G	D,F	8
H	E	6
I	H	7
J	G,I	14
K	J	18

[TURN OVER

(8)

(b) Customers arrive at a one-window drive according to a Poisson distribution with 10 mean of 10 minutes and service time per customer is exponential with mean of 6 minutes. The space in front of the window can accommodate only 3 vehicles including the serviced one. Other vehicles have to wait outside this space. Calculate :

    (i) the probability that an arriving customer can drive directly to the space in front of the window.

    (ii) the probability that an arriving customer will have to wait outside the directed space

    (iii) How long an arriving customer is expected to wait before getting the service ?

2. (a) A furniture manufacturer makes two products : chairs and tables. Processing 10 of these products is done on two machines A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A and no time on machine B. There are 16 hours per day available on machine A and 30 hours on machine B. Profit gained by the manufacturer from a chair and a table is ₹ 700 and 800 respectively. What should be the daily production of each of these two products ? FORMUATE a L.P.P. DON'T SOLVE IT.

(b) Two players A and B match coins. If the coins match, then A wins 200 units 10 of value. If the coins do not match, then B wins 200 units of value. Determine the optimum strategies as well as the value of the Game to each of the players.

3. (a) A Travelling Salesman has to visit five cities. He wishes to start from a 10 particular city, visit each city once and then return to his starting point. The travelling costs (in Rs. ,000) for the remaining cities from a particular city are given below.

To City

		A	B	C	D	E
	A	—	2	5	7	1
	B	6	—	3	8	2
From City	C	8	7	—	4	7
	D	12	4	6	—	5
	E	1	3	2	8	—

What is the sequence of the cities which shall be followed by the salesman so that the total cost is minimum ?

(b) Solve the following L.P.P. Graphically.　　　　　　　　　　　　　10

Maximize　　　　$Z = 40X_1 + 80X_2$

Subject to

$$2X_1 + 3X_2 \leq 48$$
$$X_1 \leq 15$$
$$X_2 \leq 10$$
$$X_1, X_2 \geq 0$$

4. (a) A department has 5 employees with five jobs to be performed. The time (in　10 hours) each employee will take to perform each job is given in the following matrix.

Employees

		I	II	III	IV	V
	A	10	5	13	15	10
	B	3	9	18	13	6
Jobs	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated one per employee so as to minimise the total man-hours ?

(b) Distinguish between the following.　　　　　　　　　　　　　10

　　(i) CPM and PERT

　　(ii) Float and Slack

　　(iii) Assignment Problem and Transportation Problem

　　(iv) Degeneracy in a Transportation problem and in a Simplex Method.

　　(v) Unbounded Solution in a Graphical Method and in a Simplex Method.

[TURN OVER

5.　A company has factories at F_1, F_2, F_3 which supply to warehouse at W_1, W_2, 　**20**
W_3. Weekly capacities at these factories are 200, 160 and 90 units respectively.
weekly requirements at these warehouse are 180,120 and 150 units respectively.
Unit shipping costs in rupees are as follows.

Warehouse

		W_1	W_2	W_3	Supply
	F_1	16	20	12	200
Factory	F_2	14	8	18	160
	F_3	26	24	16	90
	Demand	180	120	150	450

Determine the optimal distribution for this company to minimise the total
shipping cost.

6.　Solve the following L.P.P using Big M (Penalty) Method. 　**20**
Minimize $Z = 600x_1 + 500x_2$
Subject to
$$2X_1 + X_2 \geq 80$$
$$X_1 + 2X_2 \geq 60$$
$$X_1 , X_2 \geq 0$$

7.　The following table gives the activities and other relevant data for the project. 　**20**

Activity	Normal Time (days)	Crash Time (days)	Normal Cost (₹)	Crash Cost (₹)
1-2	4	3	6000	8000
1-3	2	2	4000	4000
1-4	5	4	7500	9000
2-3	7	5	4000	6000
2-5	7	6	8000	10000
3-5	2	1	5000	6500
4-5	5	4	6000	8500

Indirect Cost per day for the project is Rs.2000
  (i) Draw the project network.
  (ii) Find the normal duration and the total cost associated with it.
  (iii) Find the minimum duration and the associated cost.
  (iv) Find the minimum cost and the associated duration.

8. (a) Given the following optimum Simplex tableau, find the original L.P.P.   **10**

		C_j	6	8	0	0
C_B	Basis	Solution				
6	x_1	4	1	0	1/20	-1/10
8	x_2	9	0	1	-1/40	3/20
		C_j-Z_j	0	0	-1/10	-6/10

  (b) The data for a PERT network is displayed in the table below. Determine the   **10**
  critical path and the expected duration of the completion of the entire project.
    (i) What is the probability that the project duration will exceed 60 days?
    (ii) What is the chance of completing the project between 45 days and
      54 days.

Given :

z :	0.00	0.25	0.50	0.75	1.00	1.50	1.67
$p\,(Z \le z)$	0.50	0.599	0.692	.0.778	0.841	0.933	0.953

Time Duration

Activity Sequence	t_o	t_m	t_p
1-2	2	4	6
1-3	6	6	6
1-4	6	12	24
2-3	2	5	8
2-5	11	14	23
3-4	15	24	45
3-6	3	6	9
4-6	9	15	27
5-6	4	10	16

F.V.P. G.D.O.B.M

F.V.P. G.D.O.B.M

Page (12)