Faculty: Management (BBA)

Level: Undergraduate   Full Marks: 100

Semester: First   Time: 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group – 'A'

Attempt all questions   (Short answer questions)   10×2=20

1. Constructing truth table, prove that $(p \Rightarrow q) \cong (\sim q \Rightarrow \sim p)$.
2. An artist is going to arrange six paintings in row form in a wall. In how many ways can this be done?
3. Describe the nature of the roots of the equation $9x^2 + 30x + 25 = 0$. Also find its roots, if exist.
4. Solve: |2x-6|>8.
5. Find the equation of the line passing through the point (4, 8) and perpendicular to the line x+y= -9.
6. Find market equilibrium price and quantity if demand and supply equations are given by p+2q=100 and 35p-20q=350 respectively.
7. Solve: $1000\,(0.03)^{0.2^t} = 70$.
8. If $\log_a x = 12$ and $\log_a y = 36$ then find the value of $\log_a(x^3 y^4)$.
9. Find the future value if $5000 is invested for 15 years at annual interest rate of 8% compounded continuously.
10. Solve by Cramer's rule: 5x-6y=4 and 7x+2y=16.

Group – 'B'

Attempt any six questions.   (Long answer questions)   6×10=60

11. (a) From 6 gentlemen and 4 ladies a committee of 5 is to be formed. In how many ways can this be done so as to include at least 3 ladies?   **[4]**

18. There are three brands of fertilizers A, B and C. Brand A contains 1 unit of nitrogen, 2 units of potash and 3 units of phosphorus. Brand B contains 3 units of nitrogen, 1 unit of potash and 2 unit of phosphorus. Brand C contains 2 units of nitrogen, 3 units of potash and 1 unit of phosphorus. If 11 units of nitrogen, 10 units of potash and 9 units of phosphorus are necessary for a field, how much of each type of fertilizers is required for it ? (i) Use Cramer's rule (ii) Use inverse matrix method.   **[5+5]**

Group – 'C'

19. **Read the given case and answer the questions that follow:**   **[20]**

Dhurmus and Suntali opened a company to produce TV sets. Suppose you are appointed as a manager and your duty is to make decision concerning financial work. You are provided the following information: To produce TV sets, the fixed costs is $3600 and variable cost is $(100 + 2x) per unit, where x is the total number of units produced. Moreover, the selling price of the product is (500 – 2x) dollars per unit. Based on the information given to you answer the following questions:

(i)   Find the total cost function, revenue function, and profit function.

(ii) Find the averages of above functions.

(iii) Find the break even points and interpret the meaning of the point.

(iv) Find the number of TV sets to be sold that maximizes revenue.

(v) Find the maximum revenue.

(vi) Determine the number of TV sets that must be produced and sold to get maximum profit.

(vii) Find maximum profit.

(viii) What price will maximize the profit? What price maximizes the revenue?

[3+1.5+3.5+3+2+3+2+2]

(b) In a group of students, 25 students study computer, 28 study health, 20 study mathematics, 9 study computer only, 12 study health only, 8 study computer and health but not mathematics, and 5 study health and mathematics but not computer. Draw Venn diagram to represent above information and label all the areas. How many students study **[6]**
   i.   all three subjects?
   ii. mathematics and computer but not health ?
   iii. mathematics only?
   iv. any of the three subjects?

12. (a) A company manufactures two different products A and B. Each unit of product A costs $8 to produce and each unit of product B costs $6. The company insists that total cost for the two products be $960.
   (i)   Define the cost equation
   (ii) Assume the company has agreed to fill an order of 75 units of product A, how many units of product B should be produced, if total cost is to be kept at $ 960?
   (iii) If company wish to manufacture only one product, find different possibilities.
   (b) If A = [1,5) and B = (3,8], find A∪B, A∩B, A-B and B-A.   **[6+4]**

13. (a) The value of the machine is expected to decreases at a linear rate over a time. Two data points indicate that value of machine after 1 year of purchase will be $84,000 and its value after 5 years of purchase is expected to $36,000.
   (i)   Determine the equation of a line, V = mt + k, which relates value V of machine to its age t, where t is in years.
   (ii) Determine the slope and V-intercept of the line and interpret them.
   (iii) Determine t- intercept and interpret it.
   (iv) Determine expected value of machine after 4 years of purchase.
   (v)   When will the machine be valueless?
   (b) Solve: $x^2+3x+2<0$.   **[7+3]**

14. (a) A young couple wants to save $60,000 over the next 5 years and then to use this amount as a down payment on a home. To reach this goal, how much money must they deposit at the end of each quarter in an account that earns interest at the rate of 9% per year, compounded quarterly?

(b) What lump sum will be needed to generate payment of $8000 at the beginning of each quarter for a period of 10 years if money worth 8.4% compounded quarterly?   **[6+4]**

15. The spread of a highly contagious virus in a high school can be described by the logistic function
$$y = \frac{5000}{1+1000e^{-0.8x}}$$
where x is the number of days after the virus is identified in the school and y is the total number of people who are infected by the virus in the first x days.
   (a) How many students had the virus when it was first discovered?
   (b) What is the total number infected by virus during the first 12 days.
   (c) In how many days will the total number infected reach 1064?
   (d) If there are 8000 students in a college, when will the 50% of students will be infected?   **[2+2+3+3]**

16. Suppose a loan of $200,000 is borrowed at 7.2%, compounded monthly for 30 years with monthly payments of $1357.58. Find
   (a) The unpaid balance after 24 months.
   (b) How many more payments must be made, if borrower decides to pay $1450 per month after above point (24th payments).
   (c) How much would this (plan mentioned in part (b)) save over the life of the loan?

17. A company manufactures three products A, B and C each of which requires certain amounts of three raw materials as well as labor. The matrix R summarizes the requirements per unit of each product.

$$A = \begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{cccc} \text{I} & \text{II} & \text{III} & \text{Labor} \\ \left[\begin{array}{cccc} 2 & 3 & 2 & 6 \\ 3 & 2 & 8 & 8 \\ 4 & 2 & 5 & 4 \end{array}\right] \end{array}.$$

Raw materials requirements are stated in pounds per unit and labor requirements in hours per unit. The three raw materials cost Rs. 200, Rs. 800 and Rs. 250 per pound, respectively. Labor costs are Rs. 100 Per hour. Assume that 1000, 2500 and 800 units of products A, B and C are to be produced.
   (a) Find the matrix of total quantities of the four resources required to produce the desired quantities of products A, B and C.
   (b) Find the combined total cost of production by using matrix algebra.