POKHARA UNIVERSITY

Candidates are required to answer in their own words as far as practicable. The figures in the margin indicate full marks.

Section "A"
Very Short Answer Questions

Attempt all the questions. [10×2]

1. If $A = [1,5]$ and $B = (3,8)$, then, find $(A \cup B)$ and $(A - B)$.
2. Rewrite the inequality $-3 \le x \le 5$ using absolute value sign.
3. Find the inverse of the function: $f(x) = -3+5x$.
4. In how many ways the letters of the word MANAGEMENT be arranged?
5. Form a quadratic equation whose roots are: -4 and 3.
6. If $2^x = 3^y = 12^z$, Prove that: $\frac{1}{z} - \frac{1}{y} = \frac{2}{x}$.
7. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 5 \\ 4 & 1 \end{bmatrix}$ then find AB and BA.
8. Find the future value if $1000 is invested for 10 years at 8% compounded continuously.
9. In an entertainment survey of 200 people, 90 people enjoy a video only, 72 enjoy a audio only and 10 people enjoy in neither. How many of them entertain from both of media?
10. Find the Effective rate of interest if the nominal rate of interest is 9% per annum compounded quarterly.

Section "B"
Descriptive Answer Questions

Attempt any six questions. [6×10]

11. a) How many committee of 5 people be made from 6 boys and 5 girls so that there is at least two girls in the committee?

b) A firm sells a single product at $ 80 per unit. Variable cost per unit are $ 25 for raw materials and $ 27 for labor. Annual Fixed cost are $200000.

    i. Determine the total profit function in terms of number of units produced and sold.

    ii. What type of function is this?

    iii. What is the profit or loss if the firm sells 20000 units?

    iv. Find the breakeven point?

    v. For what sales units the firm suffers loss?

12. a) The demand function for a particular product is $q = f(p) = 1800-7.5p$ where q is stated in units and p is stated in dollars.
   i.   Determine the quadratic total revenue function.
   ii. What does total revenue equal at a price of $60?
   iii. How many units will be demanded at this price?
   iv. At what price will total revenue be maximum?
   v.   Find the maximum revenue.

   b) Sketch the graph of quadratic function $y = -x^2 + 2x + 5$

13.
   a) Prove that: $\begin{vmatrix} x+1 & 1 & 1 \\ 1 & y+1 & 1 \\ 1 & 1 & z+1 \end{vmatrix} = xyz\left(1 + \frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right).$

   b) There are three brand of fertilizer A, B, and C. A contains 1 unit of nitrogen, 2 units of potash and 3 units of phosphorous. B contains 3 units of nitrogen, 1 units of potash and 2 units of phosphorous. C contains 2 units of nitrogen, 3 units of potash and 1 unit of phosphorous. If 11 units of nitrogen, 10 units of potash and 9 units of phosphorous are necessary for a field, how much of each type of fertilizers is required for it? Solve by Cramer's Rule.

14. a) For a past 3 years, real state price of one area of the country have been increasing at an exponential rate of 4% per year. A home was purchased 3 years ago for $120,000.
   i.   What is its estimated value today?
   ii. Assuming appreciation (growth) continues at the same rate, what will be its value 5 years from today?

   b) According to Newsweek, DVD players entered US households faster than any other piece of home electronics equipment in history. The sales revenues from 1999 to 2004 can be modeled by the logistic function
   $$y = \frac{9.46}{1+53.08e^{-1.28x}}$$ where x is the number of years and y is in billions of dollars.
   i.   Use the model to estimate the sales revenue in the year 2004.
   ii. What is the maximum sales revenue?
   iii. When was the sales revenue equal to 5 billion dollars?

15. a) For the matrix $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 0 & 1 \\ 7 & 3 & -1 \end{bmatrix}$, find A^{-1} if exists.

   b) The cost of manufacturing three types of watches are given below:

Types of watch	Labor Hour	Material used	Subcontracted Work
X	4	12	5
Y	5	16	8
Z	6	20	10

Labor cost Rs 6 per hour, material costs Rs 10 per unit and subcontracted work cost Rs 5 per unit. Find the total cost of manufacturing 500, 400 and 300 watches of types X, Y and Z respectively.

16. a) In how many years a sum of money becomes doubles at the rate of 10% p.a. compounded semi-annually?

b) A man obtains a loan of Rs. 200,000 and agrees to repay it in 10 equals installment at 8.5% compound interest. The first payment is to be made at the end of first year. Find the amount of each installment.

17. a) How much money must be deposited at the end of each year if the objective is to accumulate Rs 250000 after 10 years? Assume interest is earned at the rate of 10% per annum compounded annually. How much interest will be earned?

b) Find the amount of an immediate annuity of Rs. 1000 a year for 7 years at 5% per-annum. How much would it amount to if it has been an annuity due?

Section "C"

Case Analysis

18. *Read the case situation given below and answer the questions that follow: [20]*

a) Bhutan Government has requested the government of Norway for the development of new hydropower project from Wong-Chhu river which lies in western Bhutan. Norway government has taken it positively and appointed Northline state hydropower Construction Company to look after the project. Northline company estimates that they will take about four years time to complete the project. To complete the project, Northline Company demands that Bhutan government should pay $ 500,000 at the beginning of the project and remaining $7,000,00 at the mid and another $300,000 at the end of the project as a guaranteed fee. As per the contract between Bhutan Government and Northline Company, Bhutan Government should pay 10% of the revenue received after selling the electricity. Bhutan government sells the electricity generated to Zingking Power Company, which is the sole buyer and distributor of electricity in Bhutan. As per the agreement of Bhutan government and Zingking Power Company, they have to pay $500 per Kilowatt to buy the electricity from Bhutan Government. In the above scenario,

   i. Construct the Cost function, Revenue and Profit function for Bhutan Government.

   ii. Determine number of kilowatts, which must be produced and sold in order to recover the assured fee.

   iii. If Bhutan government expects a profit of $2,500,000, how

many kilowatts must be produced and sold to generate the profit?

iv. If Bhutan government can sell 6,000 KW of electricity to Zingking Power Company, what is the status of profit and loss for Bhutan Government?

v. What price per KW should Bhutan government charge to Zingking Power Company if the expected profit is $ 7,000,000.

vi. What will be the total profit earned by the Bhutan government if they charge $600 per Kilowatt?

b) A politician is trying to win election to the city council, and as his campaign manager, you need to decide how to promote the candidate. There are three ways you can do so:

You can send glossy, full-color pamphlets to registered voters of the city; you can run a commercial during the television news on a local cable network; and/or you can buy a full-page ad in the newspaper.

Two hundred fifty thousand voters live in the city, and 36 % of them read the newspaper.

Fifty thousand voters watch the local cable network news, and 30% of them also read newspaper.

You also know that the television commercial would cost $ 40,000 and the newspaper ad $ 27,000, and the pamphlets mailed to voters 90 cent each, including printing and bulk rate postage.

Suppose that the success of the candidate depends on your campaign reaching at least 125,000 voters and that, because your budget is limited, you must achieve this goal at a minimum cost. Based on the above information answer the following questions:

i. How many voters in the city read the newspaper but do not watch the local cable T.V. news?

ii. How many voters read the newspaper or watch the local cable T.V. news or both?

iii. Complete the following chart by including the number of voters reached by each promotional option, the total cost cost per voter reached.

	Number of voters reached	Total Cost	Cost per voter reached
Pamphlet			
Television			
Newspaper			

iv. What would be your plan and the cost of the plan?