(2 ½ Hours)   **Marks : 75**

Use of simple calculator is allowed

All questions are compulsory subject to internal choice

Figures to the right indicate full marks

Q1 A) Fill in the blanks using correct alternatives (Any 8)   **(08)**

1. Null hypothesis is denoted by _____

    a) H_1 b) H_2

    c) H_0 d) U_0

2. In simplex, a maximization problem is optimal when all Delta J, i.e. $C_j - Z_j$ values are _____
    a) Zero or positive   b) Zero or negative
    c) Only positive   d) only negative

3. A ratio X / Y is said to be of lesser inequality if _____
    a) X > Y   b) X < Y
    c) X = Y   d) None of the these

4. A square matrix having determinant value = 0 is termed as _____
    a) Null matrix   b) Unit matrix   c) Non singular   d) Singular

5. _____ risk affects all companies but in varied degree.
a) Unsystematic risk   b) Systematic risk
c) Both (a) and (b)   d) None of these

6. _____ are measurable economic factors that surfaces after an economy has already begun to follow a particular pattern.
a) Leading indicators   b) Coincident indicators
c) Lagging indicators   d) All of the above

7. In LPP, a solution which best satisfies the objective function is called as _____
a) Optimal solution   b) Degenerate solution
c) Infeasible solution   d) Unbounded solution

8. If the null hypothesis is true and it is rejected, then _____

a) It is Type I error   b) It is Type II error   c) the decision is correct   d) None of these

9. FDIs, FIIs, long term investments and loans are all included in the _____ account of balance of payment
a) Current   b) Capital   c) Reserves   d) All of these

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10. When a ratio is compounded with itself, it is called as _____
a) Duplicate ratio   b) Triplicate ratio   c) Compound ratio   d) Sub duplicate ratio

B) State whether the following statements are True or False (Any 7)   (7)

1. Slack in LPP represents unutilized resources.

2. The difference between a country's exports & imports of tangible goods is called as current account balance.

3. When probability of different possible returns is given, we consider expected returns to calculate standard deviation.

4. If $A / B = B / C$ or $B^2 = AC$, then three quantities A, B and C are said to be in continued proportion.

5. If diagonal values in a matrix are all zero, it is termed as unit or identity matrix.

6. A redundant constraint in LPP is one that does not affect the solution.

7. Wholesale price index (WPI) measures changes in price level of goods & services that households acquire for the purpose of consumption.

8. Covariance measures volatility of a portfolio in comparison to the market as a whole.

9. Roadways, railways, schools, hospitals are all included in infrastructural facilities.

10. In simplex, when a constraint is of greater than or equal to type ($\geq$), we subtract slack.

Q2 A) Solve the following LPP graphically   (8)

Maximize $Z = 8x_1 + 5x_2$
Subject to constraints
$5x_1 + 3x_2 \geq 30$
$2x_1 + 5x_2 \geq 20$
$x_1 + x_2 \leq 8$
$x_1, x_2 \geq 0$

B) A research company claims that 50% consumers buy mobile phones online. A consumer group which does that support this claim states that the proportion is lower than 50%. A random sample of 120 consumers showed that 70 of them purchased mobile phones online. Is there enough evidence to show that the true proportion is less than 50%? (Level of significance = 5%)
                    (7)

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C) **Solve the following LPP using Simplex method** (10)

Maximize $Z = 2000x_1 + 1800x_2$
Subject to constraints:
$x_1 + x_2 \le 10$
$1000x_1 + 800x_2 \le 9000$
$x_1, x_2 \ge 0$

D) A firm produces two products X_1 and X_2 using three resources Z_1, Z_2 and Z_3. The profit contribution is Rs.20 per unit of X_1 and Rs.30 per unit of X_2. Production of a unit of X_1 requires 12 units of Z_1 and 16 units of Z_2. Production of a unit of X_2 requires 10 units of Z_2 and 30 units of Z_3.

If Z_1, Z_2 and Z_3 are available to the extent of 5000, 9000 and 12000 units respectively, Formulate LPP to maximize profit (5)

Q3 A) Find the inverse of matrix $A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}$ (8)

B) A product is sold for Rs.5600 after giving a discount of 20%. Find the original price of the product. At what price the same product should be sold if the discount rate is 30%? (7)

OR

C) If $A = \begin{bmatrix} 2 & 4 & 3 \\ -3 & -1 & 0 \end{bmatrix}$ $\qquad B = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 4 & 5 \end{bmatrix}$

Find matrix X such that $2X + A - 2B = 0$ and
Verify $(A + B)^T = A^T + B^T$ (8)

D) The price per student for an educational trip is inversely proportional to the number of students who participate in the trip. If 10 students participate in the trip, the price per student is Rs.400. What will be the price per student if 50 students participate in the trip? (7)

Q4 A) Returns of Security X and security Y under 5 possible states of nature are given to you. Calculate covariance and interpret the answer. (8)

State of nature	Probability	Returns (Security X)	Returns (Security Y)
1	0.1	-10 %	5 %
2	0.3	15 %	12 %
3	0.3	18 %	19 %
4	0.2	22 %	15 %
5	0.1	27 %	12 %

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B) Calculate Beta of the security and comment on the result. (7)

Year	% Returns (Z Ltd)	Market returns (%)
1	12	20
2	15	16
3	16	18
4	14	19
5	12	17
6	15	20
7	13	16
8	15	18

OR

C) Mr. Sanjay wants to invest in company ABC or company XYZ. The returns on stock ABC and XYZ are given below along with probabilities. Calculate Expected Returns and Standard Deviation and comment on which stock the investment should be made. (10)

Company ABC Ltd		Company XYZ Ltd	
Returns %	Probability	Returns %	Probability
12	0.10	8	0.1
14	0.25	12	0.2
16	0.30	16	0.4
18	0.25	20	0.2
20	0.10	24	0.1

D) The probability that the returns of a company will be 6%, 12% and 20 % under recession, normal and boom situation is 0.2, 0.5 and 0.3 respectively. Calculate expected returns. (5)

Q5 A) Discuss the different methods of calculating GDP or national income (8)
B) Explain Type 1 and Type 2 error in testing of hypothesis (7)

OR

Q5. Answer any 3 of the following: (15)

i) Write a short note on economic infrastructure
ii) Explain the components of current account in balance of payment
iii) Write a short note on purchasing power risk
iv) Explain the terms null hypothesis and alternative hypothesis with an example
v) Explain with example: triangular matrix and conformable matrix

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