

Total Number of Questions : 27

Time : 2.00 Hours

Max. Marks : 100

## PART – I

1. State Gauss Markov theorem. (3 Marks)
2. Explain briefly the causes of multi-collinearity. (3 Marks)
3. What is Prisoner's dilemma in game theory ? (3 Marks)
4. Explain briefly Amartya Sen's capability approach as a human development paradigm. (4 Marks)
5. Comment on the development strategy of India in the post 1991 period. (4 Marks)
6. What are the major features of GST in India ? What are the advantages of GST ? (4 Marks)
7. Explain the trends and pattern of public expenditure in India. (4 Marks)
8. What is Cobb-Douglas production function ? Give four properties of it. (4 Marks)
9. What are the major impacts of migration abroad on Kerala's economy ? (5 Marks)

## PART – II

1. Explain the basic principles of field experimentation. (3 Marks)
2. Define weakly stationary time series. Show that autocorrelation function of a weakly stationary time series is an even function of lag. (3 Marks)
3. Define ARIMA process. Consider the model given by  $(1 - B)(1 - 0.3B)X_t = (1 - 0.5B)Z_t$ , where  $Z_t$ 's are independent and normally distributed random variables with mean zero and variance  $\sigma^2$  and  $B$  is the backward shift operator. Check whether the model is an ARIMA (p, d, q) process. If yes, what are the values of p, d and q ? (3 Marks)
4. Write the non-parametric analogs of the following parametric tests :
  - a) One sample t test
  - b) t test for independent samples
  - c) Two way ANOVA. (3 Marks)
5. Distinguish between simple random sampling and stratified random sampling. (4 Marks)
6. Explain the concept of principal component analysis. (4 Marks)
7. What do you mean by multi-stage sampling ? (4 Marks)

8. The Vicker's hardness measurement of a steel used for building structures is assumed to be normally distributed with a variance of  $81 \text{ kgf/mm}^2$ . An engineer performed Vicker's test to check the hardness in 9 samples and he wishes to reject the null hypothesis if the mean is greater than  $180 \text{ kgf/mm}^2$  for testing  $H_0 : \mu = 171$  Vs  $H_1 : \mu = 183$ . What is the probability of Type I Error? Compute power. Comment on the decision made by the Engineer. (4 Marks)
9. i) What is crosstabs in SPSS ?  
 ii) Give the syntax and an example of R code for hierarchical agglomerative cluster analysis. How do you interpret the dendrogram ?  
 iii) What is a dataframe in Python ? How do you create a dataframe in Python using Pandas ?  
 iv) Name two data visualization libraries in Python. (5 Marks)

## PART - III

1. Evaluate  $\int_1^2 3x e^{2x^2-4} dx$ . (3 Marks)
2. Given the demand function  $P_d = 25 - Q^2$  and the supply function  $P_s = 2Q + 1$ . Assuming pure competition, find the Producers' Surplus (PS) (3 Marks)
3. If  $A + B = \begin{pmatrix} 1 & 0 & 2 \\ -6 & -1 & 2 \\ 0 & 3 & -5 \end{pmatrix}$  and  $A - B = \begin{pmatrix} -3 & 1 & 2 \\ 4 & 0 & 6 \\ 1 & 0 & -1 \end{pmatrix}$ . Find  $A^2 - B^2$ . (3 Marks)
4. Find the determinant of the matrix  $A = \begin{pmatrix} 1 & 4 & 2 \\ 3 & 5 & 4 \\ 2 & 3 & 2 \end{pmatrix}$ . (3 Marks)
5. Find  $\frac{dy}{dx}$  if  $y = x \ln(x^2 - x + 2)$ . (4 Marks)
6. Evaluate the maximum profit  $\pi$  for a firm, given total revenue  $R = 4000Q - 33Q^2$  and total cost  $C = 2Q^3 - 3Q^2 + 400Q + 5000$ , assuming  $Q > 0$ . (4 Marks)
7. Solve the differential equation  $t \frac{dy}{dt} = 2t + 3y$ . (4 Marks)
8. Find the future value of a principal of Rs. 100 at 5% for 10 years when compounded  
 (a) annually and (b) continually. (4 Marks)
9. a) If  $f(x) = x^2 - x + 8$  and  $g(x) = 2x - 1$ . Find  $f \circ g$ , the composition of  $f$  and  $g$ .  
 b) Evaluate  $\lim_{x \rightarrow 6} \left( \frac{x^2 - 5x + 6}{x^2 - 4} \right)$ . (5 Marks)