29 MAY 2008

Answer All Questions   Time : 03 Hours

01. (A) (i)   What are the conditions that must be satisfied by the probabilities in a discrete probability distribution?

   (ii)   Automobile arrives at the exit of the Indiana at the rate of two per minute. The distribution can be approximated to Poisson distribution.

      (a)   Find the probability of

         (i)   no automobiles arrive in a particular time.

         (ii)   at least one automobile arriving during two minutes time.

      (b)   What is the mean value when the arrival of automobile during 10 minute interval?

   (B)   (i)   What are the parameters of a normal distribution?

      (ii)   A company which produces electric items finds that the life time of the items obeys the Normal distribution. A random sample of the items has mean life time 2000 hours and standard deviation 100 hours. If an item is selected at random, find the probability that the item has a lifetime :

      (a)   between 2000 and 2085 hours

      (b)   over 2180 hours

      (c)   below 1800 hours

                                                            (20 marks)

02. (A) (i) Describe how to compute the mean and the standard deviation of a d random variable.

(ii) The following table lists the probability distribution for cash prices in a conducted at National Lottery Department store.

Price (Rs)	0	10	100	500
Probability	0.45	0.30	0.20	0.05

(a) State the random variable for the above distribution and the values random variable.

(b) If you buy a single ticket, what is the probability that you win :

(i) exactly Rs. 100?

(ii) at least Rs. 10?

(c) Compute the mean, variance and standard deviation of this distribut

(B) (i) State the Central Limit theorem.

(ii) The population distribution of gripping strengths of industrial works is kr have a mean of 110 and standard deviation of 10. A sample of 75 wo selected randomly.

(a) What is the distribution of the sample mean of gripping strength?

(b) Compute the probability that the sample mean gripping strength between 109 and 112.

(20

03. (A) (i) How does an estimate differ from an estimator?

(ii) Discuss the important properties of a good statistical estimator.

(iii) Explain the difference between a point estimate and an interval estim population parameter.

(B) The contents (in ml) of bottles of shampoo are known to be normally distributed with a standard deviation of 30 ml. A random sample of 15 bottles is found to have the following contents :

189, 204, 205, 234, 200, 198, 215, 178, 210, 212, 232, 210, 188, 201, 199

(i) Compute the point estimate of the mean content of the bottles.

(ii) Compute the 95% confidence interval for the mean content of the bottles.

(iii) Interpret what the interval estimated computed in part (ii) tells you.

(20 marks)

04. (A) The following data represent yearly sales volume (Y) and the advertising expenditures (X) of a carpet manufacturing firm.

Year	Advertising Expenditures (Rs. Million)	Sales Volume (Rs. Million)
1981	1.8	26
1982	2.3	31
1983	2.6	28
1984	2.4	30
1985	2.8	34
1986	3.0	38
1987	3.4	41
1988	3.2	44
1989	3.6	40
1990	3.8	43

(i) Draw a scatter diagram of Y against X.

(ii) By examining the scatter plot, decide whether a straight line is a reasonable model.

(iii) Calculate the correlation coefficient and comment on it.

(iv) Obtain the linear least squares regression line of Y on X for the data.

(v) Estimate the sales volume for advertising expenditure 2.5 million.

(vi) Compute the coefficient of determination and interpret it.

(20 marks)

3

05. (i) Define the term 'time series'.

(ii) Explain the components of a time series briefly.

(iii) The following table shows the quarterly sales for Toys International for the years 2004 through 2007. The sales are reported in millions of rupees.

Year	Winter	Spring	Summer	Fall
2004	170	148	141	150
2005	161	137	132	158
2006	157	145	128	134
2007	160	139	130	149

(a) Determine a typical seasonal pattern for the production data using the ratio to moving average method.

(b) Interpret the pattern.

(c) Deseasonalize the data.

(d) Determine the linear trend equation using the least squares method.

(e) Determine the seasonally adjusted production for the four quarters of 2008.

(20 marks)