Sem - II (CBSGS) / Probability & Statistics / Nov. 16

QP Code :514601

(3 hours) [Total Marks:80]

N.B.: (1) Q1. is compulsory, attempt any 4 questions out of remaining six questions
(2) Assume any necessary data to justify the same
(3) Figures to the right indicate full marks
(4) Use of scientific calculator is allowed

Q1 a) The figures in the table relate to the size of the Profit of companies (08)

Profit in Lakhs Rs.	0 - 10	10 – 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of Companies	11	25	61	97	70	61	25

Find i) Median size of capital ii) Bowley's coefficient of Skewness
iii) Coefficient of Quartile Deviation iv) Coefficient of Range

b) Prove that mean, median and mode of a Normal distribution coincide (07)

c) Find the mode for the following distribution: (05)

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	20	30	70	50	90	60	30

Q2 a) If hens of a certain breed lays eggs on 5 days a week on an average, find on how many days during the season of 100 days, a poultry keeper with 5 hens of this breed, will expect to receive at least 4 eggs. (05)

b) The size, mean and standard deviation of three samples is shown in the table below Find the combined mean and combined standard deviation. (05)

Sample -->	**Sample1**	**Sample2**	**Sample3**
Sample size	75	150	25
Mean	20	25	30
Standard Deviation	5	7	6

c) Prove that exponential distribution is memory less (05)

Q3 a) Subway trains on a certain line run every half hour between midnight and six in the morning. What is the probability that a man entering a station at random time during this period will have to wait at least twenty minutes? (04)

b) The mean weekly sales of soap bars in departmental stores was 146·3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153·7 and showed a standard deviation of 17·2. Was the advertising campaign successful? (t at 21 df. at 5% level of significance for single-tailed test is 1·72.) (04)

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Q3 c) Find kurtosis for the following data (07)

Class-Interval	0-2	2-4	4-6	6-8	8-10
frequencies	7	13	20	13	7

Q4 a) Theory predicts that the proportion of beans, in four groups A, B, C, D should be 9:3:3:1. In an experiment among 1,600 beans, the number in the four groups was 882, 313, 287 and 118. Does the experimental result support the theory? (tabulated value for $\chi 2$ for 3 d.f. at 5% LOS is 7.81) (04)

b) State and prove Bayes theorem. (04)

c) Fit a Poisson distribution to the following data which gives the number of doddens in a sample of clover seeds. Given: $e^{-1.972} = 0.1392$ (07)

No. Of Doddens(X)	0	1	2	3	4	5	6	7	8
Observed frequency (f)	56	156	132	92	37	22	4	0	1

Q5 a) Following table shows the marks in physics and statistics (08)

Marks in Physics (X)	2	6	6	5	8	4	3	9	1	5
Marks in Statistics (Y)	2	5	7	4	6	4	2	8	1	5

i) Obtain the two linear regression equations
ii) Determine the statistics marks when the marks in Physics are 7
iii) Determine the Physics marks when the marks in Statistics are 3
iv) Find the Karl-Pearson's correlation coefficient between X and Y

b) A market research firm is interested in surveying certain attitudes in a small community. There are 125 household broken down according to income, ownership of a telephone or ownership of a T.V. (07)

	Household with monthly income with Rs. 8000/- or less		Household with monthly income above Rs. 8000/-	
	Telephone Subscriber	No Telephone	Telephone Subscriber	No Telephone
Own T.V. Set	27	20	18	10
No. T.V. Set	18	10	12	10

i) What is the probability of obtaining of a T.V. owner in drawing at random
ii) If the household has a monthly income over Rs. 8,000/ and is a telephone subscriber, what is the probability that it has a T.V.?
iii) What is the conditional probability of drawing a household that owns a T.V. given that the household is a telephone subscriber.?
iv) Are the events 'Ownership of T.V. and 'telephone subscriber' statistically independent?

Q6 a) X and Y are two random variables taking values -1, 0 and 1 and having the joint probability distribution. (08)

Y / X	-1	0	1
-1	0	0.2	0
0	0.1	0.2	0.1
1	0.1	0.2	0.1

Find

i) Marginal probabilities of X and Y
ii) Conditional probability distribution of X |Y and Y|X
iii) Test whether X and Y are uncorrelated
iv) Test the independence of X and Y

b) The following table represents the scores for psychological tests (X) and arithmetical ability (Y) of children. Determine the ranks and calculate Spearman's rank correlation coefficient. Use correction factor for repeated ranks. (07)

X	105	104	102	101	100	99	98	98	93	93
Y	101	100	100	98	95	96	104	92	97	94

Q7 a) If x and y are two random variables having joint density function (08)

$$f(x) = \begin{cases} \frac{1}{8}(6-x-y); & 0 \le x < 2, \quad 2 \le y < 4 \\ 0, & \text{otherwise} \end{cases}$$

Find i) $P(X < 1 \cap Y < 3)$, ii)) $P(X + Y < 3)$, *and* (iii) $P(X < 1 \mid Y < 3)$

b) Two unbiased dice are rolled at random. Obtain the probability distribution of the X, where X denotes the sum of numbers on them. Also find the following (07)

i) Distribution Function of X
ii) Probability that the sum is less than 4 ,Probability that the sum is greater than 4, Probability that the sum is equal to 4
iii) Expectation of X and Variance of X