POST-GRADUATE COURSE

Term End Examination : June, 2017

COMMERCE

Paper-XIV : Advanced Statistical Concepts and Tools

Time : 2 Hours   **Full Marks : 50**

(Weightage of Marks : 80%)

Special credit will be given for accuracy and relevance in the answer. Marks will be deducted for incorrect spelling, untidy work and illegible handwriting. The weightage for each question has been indicated in the margin.

MODULE – I

Answer any *two* questions : $12\frac{1}{2} \times 2 = 25$

1. a) State and prove Baye's theorem on conditional probability. $6\frac{1}{2}$

 b) A company has 3 plants manufacturing 1000 scooters per month. Plant *A*, *B* and *C* manufacture 500, 300 and 200 scooters per month respectively. 90%, 92% and 95%

scooters are rated of standard quality in plant *A*, *B* and *C* respectively.

 (i) What is the probability that a scooter selected at random is of standard quality ?

 (ii) What is the probability that a scooter selected at random comes from plant *B* is if it is known that the scooter is of standard quality ?   2 + 4

2. a) The p.d.f. of a random variable *x* is given by

 $p(x) = 6x(1 - x)$ for $0 < x < 1$

      $= 0$ otherwise.

 Find $p(x < 0.35)$, $p(x > 0.5)$ and $p(0.25 \le x \le 0.75)$. $6\frac{1}{2}$

 b) The p.d.f. of lifetime (x) in a year of a musical C.D is given by

 $f(x) = c(10 - x)$, for $0 \le x \le 10$

      $= 0$,   otherwise.

 Find the expected life time of the C.D.   6

3. a) Find the mean and variance of the Binomial Distribution.   6

    b) The probability that a transistor being defective in a large consignment is 0·005. Find the mean, standard deviation, coefficient of skewness and Kurtosis of the number of defective transistors in a large consignment of 1000 transistors. What is the probability that there is at most one defective transistor in the consignment ? $6\frac{1}{2}$

4. a) A bank manager finds that the duration of time the customers have to wait for being attended to by the teller are normally distributed with mean 3 minutes and s.d. 0·5 minutes. Find the probability that a customer has to wait :

    (i)   for less than 2·5 minutes

    (ii) for more than 4 minutes and

    (iii) between 2 and 4 minutes.   6

    b) Using the following recursion relation of the Poisson distribution

    $$\mu_{r+1} = \lambda\left[\frac{d\mu_r}{d\lambda} + r\mu_{r-1}\right]\ r = 1,\ 2,\ 3\ ;........$$

    Find the skewness and Kurtosis of the distribution. $6\frac{1}{2}$

MODULE – II

Answer any *two* questions : $12\frac{1}{2} \times 2 = 25$

5. a) What an the advantages of sample survey over census ?   6

    b) Describe the different types of non-probabilistic sampling and give some business applications. $6\frac{1}{2}$

6. a) Write down the probability density function of the t-distribution and state the properties of the t-distribution. State also the application of the t-distribution for testing of hypothesis. $3 + 3 + 2\frac{1}{2}$

b) Describe the Central Limit Theorem. 4

7. a) What is a stratified sampling procedure ? Enumerate the advantages of stratified random sampling over simple random sampling. How would you allocate the size of the total sample to be drawn over the different strata ? $6\frac{1}{2}$

b) Define random sampling (i) with replacement and (ii) without replacement. Explain the terms (i) parameter, (ii) statistic and (iii) standard error of a statistic. 6

8. a) Discuss, in detail, how you would proceed to test the fallowing hypothesis at 100 α% level of significance.

(i) $H_0 : \mu_0$ against $H_1 : \mu_1 < \mu_0$ regarding the mean of a normal population with unknown s.d.

(ii) $H_0 : \sigma_1 = \sigma_2$ against $H_1 : \sigma_1 \neq \sigma_2$ regarding the s.d's of two independent normal populations with unknown means. 6

b) Number of automobile accidents per month in a certain locality were as follows :

53, 68, 59, 71, 63, 75, 56, 67, 72, 65, 58, and 66.

Are these frequencies in agreement with the belief that accidental conditions are same during the 12 months period ?

[Given $\chi^2_{0.5,\ 11} = 19 \cdot 675$] $6\frac{1}{2}$

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