**Bachelor of Arts (General) Degree Second Examination (External) - 2012
March - May 2015**

Faculty of Social Sciences

Social Statistics - SOST- E2025

Statistical Theory

Answer four (04) questions only

No. of questions : 06   **Time : 03 Hours**

Calculators are allowed
Statistical tables will be provided

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01.   I.   Two groups of candidates are competing for the positions on the Board of Directories of a company. The Probabilities that the first and second groups will win are 0.6 and 0.4 respectively. If the first group wins , the probability of introducing a new product is 0.8 and the corresponding probability if the second group wins is 0.3 . What is the probability that the new products will be introduced?

       II.   A bag contains 5 white and 8 red balls. Two drawings of 3 balls are made such that.
(a) the balls are replaced before the second trial, and   (b) the balls are not replaced before the second trial. Find the Probability that the first drawing will give 3 white and the second 3 red balls in each case.

       III.   Out of 5 Mathematicians and 7 Economists, a committee consisting of 2 Mathematicians and 3 Economists is to be formed. In how many ways can this be done if.
(a) any Mathematician and Economist can be included.
(b) one Economist must be on the committee.
(c) Two Mathematicians cannot be on the committee.

IV.   The number of days in a 50 day period during which X automobile accidents occurred in a city given below. Assuming a Poisson distribution, test the gooness of fit. (α = 0.05)

No.of Accidents (x)	No.of Days (f)
0	21
1	18
2	07
3	03
4	01
	50

02. I.   Marks in an examination were normally distributed with mean μ and standard deviation ò .10% of the candidates had more than 75 marks and 20% had less than 40 marks. Find the value of μ and ò

II.   The income of a group of 10,000 persons was found to be normally distributed with mean Rs 750 per month and standard deviation Rs 50 Show that of this group about 95% had income exceeding Rs.668 and only 5% had income exceeding Rs. 832. What was the lowest income among the richest hundreds.

III.   A box contains 100 batteries .20 of which are defective ,10 are selected for inspection. Indicate what is the probability that,

(a) all 10 are defective
(b) at least 1 defective
(c) at the most 3 defective
(d) more than 7 defective

IV   The distribution of typing mistakes in a book committed by a typist is given below. Assuming a poisson distribution, find out the expected frequencies.

Mistakes per page	0	1	2	3	4	5
No.of pages	142	156	69	27	5	1

V. What are the assumptions of poisson distribution ?

03. I.   The marks of 400 examinees are given below .

Marks	Educational Qualifications		
	B.A.	B.Sc	B.Com
Below 50	90	30	60
Between 50and60	20	70	70
Above 60	10	30	20

if an examinee is selected from this group of examinees, find
(a) The probability that he is a commerce graduate

(b) The probability that he is a Science graduate, given that his score is above 60

(c) The probability that his score is below 50, given that he is a B.A.

II. In a certain sample of 2000 families. 1400 families consume tea. Out of 1800 Hindu. families ,1236 families consume tea. Use Chi-square test and state whether there is any significant difference between consumption of tea among Hindu and non- Hindu families.

III. A random variable X has the following probability distribution.?

X	0	1	2	3
P(x)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{2}{15}$

Find,

a) $E (x^2 + 3x - 1)$
b) $E (6x + 3x^2)$
c) $v (x)$

IV. The probability density function of X has given below

$f (x) =$ x $; 0 \leq x \leq 1$

   $= 2\text{-}x$ $; 1 \leq x \leq 2$

   $= 0$ otherwise

Find,
(a) $P (0.8 \leq x \leq 1.2)$

(b) $V (x)$

V.   What is addition low and multiplication low of probability?

04.   I)   The joint probability density function of X and Y has given below

$$f (xy) = \begin{cases} \frac{6}{7} \dfrac{[x^2 + \underline{xy}]}{2} & ; \ 0 \leq x \leq 1 \\ & \ \ 0 \leq y \leq 2 \\ 0 \quad \text{elsewhere} \end{cases}$$

Find , cov(xy) (covariance xy)

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II). What are the properties of binomial distribution and Hypergeometric distribution.

III). Differentiate the following concepts

   (a) Events and experiments
   (b) Point estimation and interval estimation.
   (c) Sample space and event space.
   (d) Random samples and non-random samples.
   (e) Discrete uniform distribution and continuous uniform distribution.

05. A random sample of 1000 farms in a certain year gives an average yield of Wheat 2000 lbs per acre. With a standard deviation of 192 lbs. A random sample of 1000 farms in the following year gives an average yield of 2100 lbs with a standard deviation of 224 lbs.

   (a) Can it be concluded that there is a significant difference in the mean yields.(Significance level $\alpha = 0.05$)
   (b) Construct a 95% confidence interval for the difference of mean yields.

   II). A random sample of size 16 has 53 as mean. The sum of the squares of the deviations taken from mean is 150. Obtain 95% and 99% confidence limits of the mean of the population.

   III). 4 coins were tossed 160 times and the following results were obtained .

No of Heads	0	1	2	3	4
Observed frequencies	17	52	54	31	6

   Under the assumption that coins are balanced, find the expected frequencies of getting 0,1,2,3 and 4 heads and test the goodness of fit.($\alpha = 0.01$)

   IV). Write a short note on goodness of fit test.

06.   Write notes on the following topics.

I.   Critical region and critical value
II.   Tails of a test
III. Bayes theorem
IV.   Normal distribution
V.   Exponential distribution.

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