# **CHRIST UNIVERSITY, BENGALURU - 560029**

## End Semester Examination March - 2016 Bachelor of Science - CMS / EMS - II SEMESTER

Code: STA231 Max.Marks: 100

Subject: PROBABILITY DISTRIBUTIONS AND STATISTICS IN POPULATION

**STUDIES** 

**Duration: 3Hrs** 

#### **SECTION A**

## Answer any 10 questions

10X3=30

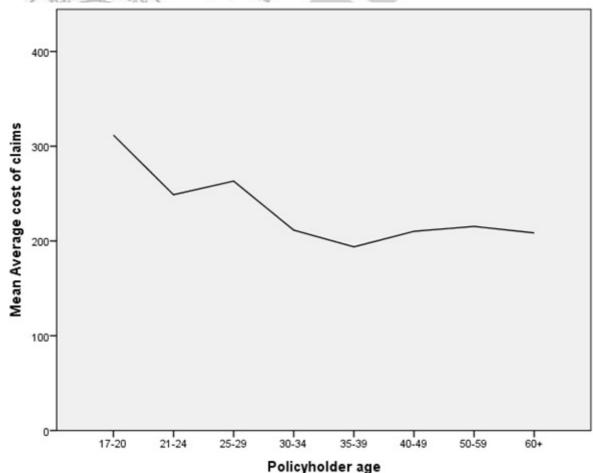
- 1 What is the function of "SORT" and "SPLIT FILE" in SPSS?
- What are the steps for recoding variables in SPSS?
- 3 How do you define independence in terms of distribution functions for continuous random variables?
- 4 Define conditional probability function of X given Y. Give the formula for conditional expectation.
- 5 Write the experimental conditions under which binomial distribution is used.
- 6 Give the situation where the following distributions can be applied (i) binomial, (ii) Poisson, (iii) Geometric
- 7 Mention any three characteristics of a normal distribution.
- **8** Define Cauchy Distribution and state its additive property.
- 9 Show that Karl Pearson's correlation coefficient lies between -1 and +1.
- 10 Derive the relationship between correlation coefficient and regression coefficients.
- 11 Explain gross reproduction rate and net reproduction rate.
- Explaining the notations show that  $nq_x = \frac{d_x + n 1}{l_x}$

#### **SECTION B**

## Answer any 5 questions

5X6=30

- 13 (a) Explain the procedure of constructing various graphs using SPSS.
  - (b) The following is the output from SPSS. Identify the graph and write the procedure to plot it.



Check whether the following function is a valid probability density function. Examine the independence of  $Y_1$  and  $Y_2$ .  $f(y_1,y_2) = \begin{cases} 4y_1y_2 & , 0 \leq y_1 \leq 1, 0 \leq y_2 \leq 1 \\ 0 & , otherwise \end{cases}$ .

- 15 Derive the mode of Poisson distribution.
- 16 Derive the mgf of geometric distribution and hence obtain its mean and variance.
- 17 Show that exponential distribution lacks memory.
- 18 Derive an expression for Spearman's correlation coefficient.
- 19 From the following data, compute (i) G.F.R, (ii) TFR and (iii) the gross reproduction rate assuming that for every 100 girls 106 boys are born.

Age Group	Female population	Age - SFR
15 – 19	212619	98.0
20 – 24	198732	169.6
25 – 29	162800	158.2
30 – 34	145362	139.7
35 – 39	128109	98.6
40 – 44	106211	42.8
45 - 49	86753	16.9

## **SECTION C**

## Answer any 4 questions

4X10=40

20 Check whether the following function is a valid probability density function. Examine the independence of Y<sub>1</sub> and Y<sub>2</sub>.

$$f(y_1,y_2) = \left\{ egin{array}{ll} 6(1-y_2) & ,0 \leq y_1 \leq y_2 \leq 1 \ 0 & ,otherwise \end{array} 
ight.$$
 Also find P(0

- Define Poisson distribution. Prove that for a Poisson distribution  $\mu_{\gamma+1} = \lambda \left(r\mu_{\gamma-1} + \frac{d\mu_{\gamma}}{d\gamma}\right)$  and hence obtain the coefficients of skewness and kurtosis.
- 22 (a) Derive mode of a normal distribution.
  - (b) The volume of emulsion paint, in a plastic tub, may be assumed to be normally distributed with mean 10.25 litres and variance  $\sigma^2$ .
  - (i) Assuming  $\sigma^2 = 0.04$ , determine the probability that the volume is less than 10 lit.
  - (ii) Find the value of  $\sigma$  so that 98% of the tubs contain more than 10 lit of emulsion paint.
- 23 (a) Derive the mgf of two parameter gamma distribution and hence obtain the mean and variance. Show the relationship between the mean and variance.
  - (b) The number of miles that a particular car can run before its battery wears out is exponentially distributed with an average of 10,000 miles. The owner of the car needs to take a 5000-mile trip. What is the probability that he will be able to complete the trip without having to replace the car battery?
- 24 Derive an expression for angle between two regression lines and discuss all cases.
- 25 Given  $l_{01} = 871$  and

where l<sub>x</sub> and d<sub>x</sub> have their usual meanings. Complete the life table and find the probability that,

- (i) a person aged 93 will die in three years.
- (ii) a person aged 92 will survive up to age 96.
- (iii) of three persons aged 92, 93 and 94 at least 2 will survive 4 years.
- (iv) of three persons aged 92, 93 and 94 all will survive 4 years.