



**UNIVERSITY OF THE PUNJAB**  
B.S. 4 Years Program / Second Semester – 2019

Roll No. ....

Paper: Statistics-II  
Course Code: STAT-103, STT-12314 Part – II

Time: 2 Hrs. 45 Min. Marks: 50

**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

- Q.2 Define the following: (20)
- (i) Moment generating function
  - (ii) Baye's theorem
  - (iii) Mathematical expectation
  - (iv) Four properties of Normal distribution
  - (v) Poisson distribution
- Q.3 If 3 books are picked at random from a shelf containing 6 novels, 4 poems books and a dictionary, what is the probability that (05)
- (a) the dictionary is selected,
  - (b) 2 novels and 1 poem book are selected?
- Q.4 The probability that a married man watches a certain T.V. show is 0.4 and the probability that his wife watches the show is 0.5. The probability that a man watches the show given that his wife does, is 0.7. Find the probability that (05)
- (a) a wife watches the show, given that her husband does,
  - (b) At least one person of a married couple will watch the show.
- Q.5 A continuous random variable X that can assume values between 2 and 5 has density function given by  $f(x) = A(1+x)$  (05)  
Find (a) A (b) median (c)  $P(3 \leq X < 4)$
- Q.6 The IQs of 1000 applicant to a certain college are approximately normally distributed with a mean of 110 and a standard deviation of 15. If the college required an IQ of at least 95, how many of these students will be rejected on this basis? (05)
- Q.7 Derive Mean-deviation about median for normal distribution  $(\mu, \sigma)$ . (05)
- Q.8 For a Poisson distribution  $P(X = 1) = 0.3650$  and  $P(X = 2) = 0.1606$  find  $P(X = 3)$  (05)



# UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – 2019

Paper: Statistics-II

Course Code: STAT-103, STT-12314 Part – I (Compulsory) Time: 15 Min. Marks: 10

Roll No. in Fig. ....

Roll No. in Words. ....

Signature of Supdt.:

**ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.**

**Division of marks is given in front of each question.**

**This Paper will be collected back after expiry of time limit mentioned above.**

Q.1. Encircle the right answer cutting and overwriting is not allowed. (10x1=10)

Q.1 Encircle the correct answer in the following. (10)

- I. The joint probability of two dependent events A and B is:  
(a)  $P(A) + P(B) - P(A \cap B)$  (b)  $P(A)P(B)$   
(c)  $P(A)P(B/A)$  (d)  $P(A) + P(B)$
- II.  $P(A) = 0.65$   $P(B) = 0.45$ , which of the following statements is true  
(a) A and B are dependent (b) A and B are mutually exclusive  
(c) A and B are not mutually exclusive (d) A and B are independent
- III. If X and Y are two independent variables, then  $\text{Var}(X-Y)$  is equal to  
(a)  $\text{Var}(X) - \text{Var}(Y)$  (b)  $\text{Var}(X) + \text{Var}(Y) - 2 \text{cov}(X, Y)$   
(c)  $\text{Var}(X) + \text{Var}(Y)$  (d) None of above
- IV. The Cumulative distribution function of a random variable X denoted by F(a) is defined as  
(a)  $F(a) = P(X \leq a)$  (b)  $F(a) = P(X \geq a)$   
(c)  $F(a) = P(X = x)$  (d) None of above.
- V. For binomial distribution b(x; 12, 0.6), the mean is:  
(a) 6 (b) 7.2  
(c) 2.88 (d) 1.70
- VI. A binomial distribution may be approximated by a Poisson distribution when:  
(a) n is large and P is small (b) n is small and P is large  
(c) Both n and P are small (d) Both n and P are large
- VII. Variance of a hyper geometric distribution, h(x; N, n, K) is:  
(a) nP (b) nPq  
(c)  $nPq \left( \frac{N-n}{N-1} \right)$  (d) None of these
- Where  $P = \frac{K}{N}$ ,  $P + q = 1$
- VIII. A continuous probability distribution is not represented by:  
(a) A graph (b) A table  
(c) A Mathematical function (d) A density function
- IX. For a normal distribution with mean 40 and variance 10, how much area will be scanned to left of  $X = 40$   
(a) 0.65 (b) 0.5  
(c) 0.95 (d) Zero
- X. In a normal distribution  $N(\mu, \sigma)$  Quartile deviation is equal to:  
(a)  $\frac{4}{5}\sigma$  (b)  $\frac{2}{3}\sigma$   
(c)  $2\sigma$  (d)  $0.95\sigma$



# UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – Spring 2022

Paper: Probability and Probability Distributions

Course Code: STAT-102

Roll No. ....

Time: 3 Hrs. Marks: 60

## THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

**Q.1. Answer the following short questions. (6x5=30)**

- Write down six steps of testing procedure of the hypothesis  $H_0: \mu = \mu_0$ .
- Explain the difference between parameter and statistic.
- What is bias and how it can be reduced?
- Distinguish between Simple hypothesis and Composite hypothesis.
- Distinguish between Type I-Error and Type II- Error.
- Explain the central limit theorem.

**Answer the following questions. (3x10=30)**

**Q.2 (a)** The length of life for a washing machine is approximately normally distributed, with a mean of 3.5 years and a standard deviation of 1.0 years. If this type of washing machine is guaranteed for 12 months, what percentage of the sales will require replacement?

**Q.2 (b)** Random sample of size 100 are drawn with replacement from two populations and their means  $\bar{X}_1$  and  $\bar{X}_2$  are computed. If  $\mu_1 = 10, \sigma_1 = 2, \mu_2 = 8, \sigma_2 = 1$ , find the probability that the difference between a given pair of sample means is greater than 1.75 but less than 2.5.

**Q.3 (a)** It is claimed that an automobile is driven on the average no more than 12000 miles per year. To test this claim, a random sample of 100 automobile owners are asked to keep a record of the miles they travel. Would you agree with the claim if the random sample showed an average of 12500 miles and a standard deviation of 2400 miles?

**Q.3 (b)** Five samples of a ferrous-type substance are to be used to determine if there is a difference between a laboratory chemical analysis and an X-ray fluorescence analysis of the iron content. Each sample was split into two subsamples and the two types of analysis were applied. Following are the coded data showing the iron content analysis:

Analysis	Sample				
	1	2	3	4	5
X-ray	2.0	2.0	2.3	2.1	2.4
Chemical	2.2	1.9	2.5	2.3	2.4

Assuming that the populations are normal, test at the 0.05 level of significance whether the two methods of analysis give, on the average, the same result.

**Q.4 (a)** There are 7 red and 5 black balls in a box. Three balls are to be selected one after the other. What is the probability of selecting a red ball followed by the black and red ball. (5)

**Q.4 (b)** A random sample of 200 married men, all retired, was classified according to education and number of children.

Education	No. of children		
	0 - 1	2 - 3	>3
Elementary	14	37	32
Secondary	19	42	17
College	12	17	10

Test the hypothesis of independence of the two criteria of classification. (5)



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Paper: Statistics-II

Course Code: STAT-103

Roll No. ....

Time: 3 Hrs. Marks: 60

## THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

**Q.1. Answer the following short questions. (15x2=30)**

- i) What is a random experiment?
- ii) What are independent events?
- iii) What is the difference between classical and empirical probability?
- iv) Given  $P(A) = 0.60$ ,  $P(B) = 0.40$ , and  $P(A \cap B) = 0.24$ , find  $P(A|\bar{B})$
- v) State the general addition law of probability for two events A and B.
- vi) What is discrete probability distribution?
- vii) Show that  $E[X - E(X)]^2 = E(X^2) - [E(X)]^2$
- viii) Write two conditions that must be satisfied by a probability density function.
- ix) Two independent random variables are such that  $\text{Var}(X_1) = k$ ,  $\text{Var}(X_2) = 2$ , and  $\text{Var}(3X_2 - X_1) = 25$ . Find  $k$ .
- x) Describe the significance of moments in a probability distribution.
- xi) What is main difference between binomial and hypergeometric experiment?
- xii) If mgf of X is given by  $M_0(t) = (0.4 + 0.6 e^t)^8$ . Find  $E(X)$  and  $\text{Var}(X)$ .
- xiii) If X has binomial distribution with mean = 12 and variance = 4, find  $p$  and  $n$ .
- xiv) Given that X has a Poisson distribution with  $P(X=1) = P(X=2)$ . Find  $\text{Var}(X)$
- xv) Write a short note on importance of the normal distribution.

**Answer the following question. (6x5=30)**

- Q.2** The probability that a married man watches a certain television show is 0.4 and the probability that his wife watches the show is 0.5. The probability that a man watches the show, given that his wife does, is 0.7. Find the probability that
- (i) a married couple watches the show;
  - (ii) at least one person of a married couple will watch the show.
- Q.3** An employer wishes to hire three people from a group of 15 applicants, 8 men and 7 women, all of whom are equally qualified to fill the position. If he selects the three at random, what is the probability that (i) all three will be men; (ii) at least two will be women?
- Q.4** If on the average rain falls on twelve days in every thirty, find the probability that (i) the first three days of a given week will be fine and the remaining wet (ii) rain will fall on just three days of a given week.
- Q.5** Derive the Poisson distribution as the limiting form of the binomial distribution
- Q.6** A continuous random variable X has the probability density function  $f(x) = 20x^3(1-x)$  for  $0 \leq x \leq 1$  and zero elsewhere  
Find distribution function of X. Hence or otherwise find  $P\left(\frac{1}{4} < X < \frac{1}{2}\right)$
- Q.7** The lifetime of a certain type of battery can be closely approximated by the normal curve with a mean of 350 hours and a standard deviation of 50 hours.  
(i) What percentage of these batteries will have lifetime of more than 375 hours?  
(ii) Above what value will the best ten percent of the batteries lie?