UNIVERSITY OF THE PUNJAB

Fifth Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig. .....

Roll No. in Words. .....

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Signature of Supdt.:

PAPER: Probability Theory (Theory) **MAX. TIME: 15 Min.**

Course Code: STAT-307 Part–I (Compulsory) **MAX. MARKS: 10**

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. 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. (1x10=10)

I. The probability generating function exist only for..... distributions.
   a. discrete
   b. continuous
   c. degenerate
   d. binomial

II. 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. n is small and p is small
   d. n is large and p is large

III. When n=1 then binomial experiment reduces to.....
   a. Bernoulli trial
   b. Rectangular distribution
   c. Geometric distribution
   d. Negative binomial distribution

IV. In the binomial experiments, the number of success .....and the number of trials is .....
   a. fixed, varies
   b. fixed, fixed
   c. varies, fixed
   d. varies, varies

V. There are experiments in which number of successes is fixed and the number of trials varies to produce the fixed number of successes. Such experiments are called ....
   a. Geometric experiments
   b. Binomial experiments
   c. Bernoulli experiments
   d. Negative binomial

VI. If a letter is chosen at random from the 11 letters of the word probability, what is probability that it is a vowel?
   a. 7/11
   b. 4/11
   c. 3/11
   d. 5/11

P.T.O.

VII. The experiment is repeated a variable number of times until to obtain a first success is called a.....

a. Hypergeometric experiment
b. Geometric experiment
c. Bernoulli experiment
d. Negative binomial experiment

VIII. The shape of the Poisson distribution depends on its ..... ;

a. Parameter
b. variance
c. sample size
d. x values

IX. The Poisson distribution tends to be symmetrical as ..... becomes larger and larger.

a. μ
b. n
c. p
d. theoretical values

X. In which distribution variance is greater than its mean?

a. Geometric
b. Poisson
c. multinomial
d. negative binomial
e. discrete uniform

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Fifth Semester – 2019

Examination: B.S. 4 Years Program

Roll No. .....

PAPER: Probability Theory (Theory)
Course Code: STAT-307 Part – II

MAX. TIME: 2 Hrs. 45 Min.
MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2 Write short answer on the following questions. (20)

a) Describe the classical, relative frequency, and subjective concepts of probability.
b) If $P(A) = 0.3, P(B) = 0.4,$ and $P(A \text{ and } B) = 0.2$, are A and B independent.
c) How does conditional probability relate to the concept of independence?
d) Differentiate between independent and mutually exclusive events. Are independent events mutually exclusive?
e) Find the probability of being dealt a bridge hand of 13 cards containing 5 spades, 2 hearts, 3 diamonds and 3 clubs.
f) When flipping an unbiased coin, determine the probability that the 7^{th} head occurs on the 13th trial.
g) In Bayes theorem, how does the prior probability differ from the revised probability?
h) Describe the significance of moments in probability distribution.
i) What is the meaning of the expected value of a probability distribution?
j) What are the four properties that must be present in order to use Poisson distribution?

Q.3.a) A patient is thought to have one of three diseases A, B and C, whose probabilities under given conditions are 0.5, 0.3 and 0.2 respectively. A test is carried out to help the diagnosis and it yields a positive result with a probability of 0.1 for disease A, a probability of 0.2 for disease B and a probability of 0.9 for disease C. The test is conducted 6 times and the results are positive 4 times and negative twice. What is the probability of each disease after testing?

b) A bag contains 3 red 5 black balls and another 4 red and 7 black balls. A ball is drawn from a bag selected at random. Find the probability that it is red.

(7+3)

Q.4 Compute the probability generating function, cumulants, factorial cumulants, coefficient of skewness and kurtosis of negative binomial distribution.

(10)

Q.5.a) Describe the geometric experiment and show that its mean greater than its variance.

b) The probability that a person will install a black phone in a residence is estimated to be 0.3. Find the probability that the 10^{th} phone installed in a new subdivision is the 1st black phone.

c) Determine the probability that the income tax authorities will catch 3 income tax returns with illegitimate deductions, if it randomly selects 6 returns among 20 income tax returns of which 8 contain illegitimate deductions.

(4+3+3)