UNIVERSITY OF THE PUNJAB

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

Roll No. .....

Paper: Statistics-II **Course Code: STAT-103** **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 $Var(X)$.
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
$f(x) = 20\, x^3\, (1 - x)$ 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?