V.P & R.P.T.P. SCIENCE COLLEGE, V.V.NAGAR
B.Sc. Semester – IV Examination
Internal Test – 2019
Foundation of Statistics – II
(US04FSTA01)
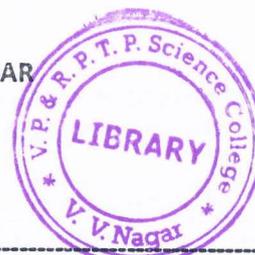
Tuesday, 5ᵗʰ March, 2019
Time: 3.00 to 5.00 pm

M. Marks : 50

Note: (i) Figures to the right indicate marks (ii) Graph paper will be provided on request.
(iii) Simple or scientific calculator is allowed. (iv) Q.3 to Q.6 each sub question is of 4 marks.

Q.1   Multiple Choice Questions   (1 × 8)

(1)   Which of the following is true?

(a) $r = \pm\sqrt{b_{XY} \times b_{YX}}$ (b) $b_{XY} = r\frac{S_X}{S_Y}$ (c) $-1 \le r \le 1$ (d) All of the above

(2)   Consider the following probability distribution:

$P(x) = \binom{10}{x}(0.3)^x(0.7)^{10-x}, x = 0, 1, \dots, 10$ then $P(X \le 10) = $ _____

(a) 0   (b) 0.21   (c) 1   (d) 0.45

(3)   Which of the following values cannot occur in a chi square distribution?

(a) 2.25   (b) -3.01 (c) 11.74   (d) 51.12

(4)   If the random variable Z is the standard normal score, which of the following probabilities could easily determined without referring to a table?

(a) $P(Z > 0)$ (b) $P(Z < -1.82)$ (c) $P(Z > 1.02)$ (d) $P(Z < -2.01)$

(5)   If $\frac{6\sum di^2}{n(n^2-1)}$ is zero then the rank correlation coefficient be

(a) 0.5   (b) -1 (c) 1   (d) Impossible to calculate

(6)   Let $X \sim b(12, 0.15)$ then $P(X \ge 4) = $ _____

(a) 0.9078   (b) 0.9761   (c) 0.9957   (d) 0.0922

(7)   Find the area under the standard normal curve between $Z = 1$ and $Z = 2.32$

(a) 0.8413   (b) 0.5398   (c) 0.1485   (d) 0.1359

(8)   Correlation coefficient is the _____ of two regression coefficients

(a) Median   (b) Arithmetic Mean   (c) Harmonic Mean   (d) None of the above

Q.2   Short Type Questions (Attempt Any Five)   (2 × 5)

(1)   Two regression equations are $Y = -3.75 + 1.25X$ and $X = -1.47 + 0.36Y$. Find the coefficient of correlation between X and Y.

(2)   Give some practical situations where Poisson distribution may be used.

(3)   The probability that a patient will get reaction of a temiflu injection is 0.10. If 12 patients are given that injection, find the probability that 3 or more will get reaction from that injection.

(4)   Give two examples each of
(i) Positive correlation (ii) Negative correlation (iii) Spurious (Non - sense) correlation.

(5)   Write in brief on chi square test in a 2 × 2 contingency table.

(6)   The number of customers entering a bank per minute is a Poisson variate with a mean of 4 customers per minute. What is the probability that more than three customers enter the bank in minute?

(7)   Define Normal distribution. State any four properties of it.

(8)   What is regression? Write down the regression equation which could be used to estimate the values of X for any given values of Y. Write down the formulae to calculate each term in the above equation.

Q.3(a)   Write a note on Spearman's rank correlation coefficient method.

(b)   Juhi's parents recorded his height at various ages up to 66 months. Below is a record of the results:

Age (months)	36	48	60	72	84
Height (in inches)	35	38	41	43	45

Find the equation of the least-squares regression line of Juhi's height on age? Predict the height at the age of 8 years.

OR

Q.3(a)   What is correlation? List out the various methods of studying correlation. Write in brief about any one of

them.

(b) A random sample of seven drivers insured with a company and having similar auto insurance policies was selected. The following table lists their driver experiences (in years) and monthly auto insurance premiums (in dollars)

Driving Experience	5	2	12	9	15	6	25
Monthly Insurance Premiums	64	87	50	71	44	56	42

(i) Does the insurance premium depend on driving experience? Justify your answer by calculating most suitable statistical measure (ii) Predict the monthly auto insurance premium for driver with 14 years of driving experience.

Q.4(a) It was claimed that 1 out of 50 dentists recommend Colgate sensitive tooth paste to his patients in sensitivity of teeth. Suppose that the claim is true. If 120 dentists are selected independently and at random. Let X be the no. of dentists who recommend Colgate sensitive paste to his/her patients. Name the distribution of X and state its mean and standard deviation. Calculate (i) $P(X > 3)$ (ii) $P(X < 2)$

(b) A random variable X follows Poisson distribution with mean 2.
Find (i) $P(X = 1)$ (ii) $P(X \leq 2)$ (iii) $P(X \geq 1)$ (iv) $P(1 \leq X \leq 4)$.

OR

Q.4(a) If 10% of pregnancies result in a miscarriage, what is the probability that :
(i) Exactly 5 (ii) more than 4 (iii) at least 2, out of 12 randomly chosen pregnant women have miscarriages.

(b) An institute found that 2% of the registered students withdraw without completing a course on C++. If 150 students have registered in the current batch, compute the probability that (a) More than 3 (b) Exactly four, will withdraw.

Q.5(a) Given that Z is a standard normal variable, Sketch each one and evaluate the following probabilities.
(i) $P(Z \leq -1.06)$ (ii) $P(Z \leq 1.78)$ (iii) $P(Z \geq -1.27)$ (iv) $P(-1.26 \leq Z \leq 1.62)$ (v) $P(Z \geq -1.43)$

(b) The mean and standard deviation of marks of 500 students in an examination are 52 and 8 respectively. If the distribution of the marks is approximately normal, Find % of Students getting marks (i) more than 60 (ii) between 48 and 56.

OR

Q.5(a) The measurement of the length of the index finger of a human right hand is a normally distributed variable with a mean of 6 cm. and a standard deviation of 0.5 cm. What is the probability that the finger length of a randomly selected person will be (i) between 5 cm. and 7.2 cm (ii) more than 4.7 cm (iii) at least 5.3 cm.

(b) Let X be a normal variate with mean 5 and standard deviation 3. Determine the following probabilities:
(i) $P(X > 3.2)$ (ii) $P(X < 2.5)$ (iii) $P(1.2 < X < 4.2)$ (iv) $P(2.7 < X < 5.3)$

Q.6 A plant breeder wants to know if the sterility of rice is a genetic problem. Samples were taken from a large field study of 400 plots and the sterility of each plot was rated as follows:

Sterility	Genotypes			
	A	B	C	D
No problem	20	15	12	10
Moderate	70	60	80	50
severe	10	25	8	40

Test the hypothesis that the severity of sterility is independent of genetic make – up or genotypes.

OR

Q.6 A study is conducted to determine whether the use of electronic fetal monitoring (Sonography) during labor affects the frequency of caesarian section deliveries. Caesarian delivery can be thought of as "disease" and electronic monitoring as the "exposure". Of the 5824 included in the study, 2850 were electronically monitored during labor and 2974 were not. The outcomes are as follows:

Caesarian delivery	EFM exposure (Sonography)		Total
	Yes	No	
Yes	358	229	587
No	2492	2745	5237
Total	2850	2974	5824

Is there any association between the use of electronic fetal monitoring and the eventual method of delivery?