B.Tech. (CSE) 2nd Semester (G-Scheme)

Examination, May-2024

MATH-II

Paper : BSC-Math-104G

Probability and Statistics

Time allowed : 3hours] *[Maximum marks : 75*

Note: *Attempt **five** questions in total by selecting **one** question from each unit. **Question No. 1** is **compulsory**.*

1. (a) If X and Y are Independent random variable then show that $E(XY) = E(X).E(Y)$

(b) Define multinomial distribution.

(c) Discuss Gamma distribution and find its mean.

(d) Fit the curve $y = ae^{bx}$ to the following data :

x	2	4	6	8
y	25	38	56	84

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(e) Write a short note on :

(i) Critical Region

(ii) Errors

(iii) Level of significance

(f) A random sample of 27 pairs of observations from a normal population gives correlation coefficient of 0.42. Is it likely that the variables in the population are un correlated ? 15

Unit–I

2. (a) A student takes his examination in four subjects P, Q, R, S. He estimates his chances of passing in P as $\frac{4}{5}$, in Q as $\frac{3}{4}$, in R as $\frac{5}{6}$ and in S as $\frac{2}{3}$. To quality, he must pass in P are at least two other subjects, What is the probability that he qualifies ?

(b) A die is tossed thrice. A success is getting '1 or 6' on a toss. Find the mean and variance of the number of successes. 15

3. (a) Show that if μ and σ be the mean and s.d. of a random variable X with p.d.f. $f(x)$ then :

$P[\mu - K_6 < X < \mu + K_6] = P[|X - \mu| < K_6] \geq 1 - \frac{1}{K^2}$ where K is same positive constant.

(b) A manufacturer knows that the condensers he makes contain on an average 2% defective, he packs them in a boxes of 100. What is the probability that a box selected at random will contain 3 or more faulty condensers ? 15

Unit-II

4. (a) If $f(x) = 6x(1-x), 0 \leq x \leq 1$. Verify that it is a p.d.f. Also final the mean and variance.

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. 15

5. (a) If X and Y are two continuous independent random variable then determine the p.d.f. of quotient $Z = \frac{X}{Y}$.

(b) State and prove Baye's Rule. 15

Unit–III

6. (a) Calculate mean and mode of the following data relating to weight of 120 articles :

Weight (In gm)	0-10	10-20	20-30	30-40	40-50	50-60
No. of articles	14	17	22	26	23	18

(b) The first four moments about the working mean 28.5 of distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about mean. Also evaluate β_1, β_2 and comments upon skewness and kurtosis of the distribution. 15

7. (a) Three judges A, B, C give the following ranks. Find which pair of judges have common approach ?

A	1	6	5	10	3	2	4	9	7	8
B	3	5	8	4	7	10	2	1	6	9
C	6	4	9	8	1	2	3	10	5	7

(b) Find the regression line y on x for the following :

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	25	36	41	49	40	50

15

Unit–IV

8. (a) A sample of 900 members is found to have a mean of 3.4cm. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25cm and s.d. 1.61cm.

(b) A group of 10 rats fed on a diet *A* and another group of 8 rats fed on a different diet *B*, recorded the following increase in weights :

Diet A :	5	6	8	1	12	4	3	9	6	10	gm
Diet B :	2	3	6	8	10	1	2	8	gm		

Does it show the superiority of diet A over that of B ? 15

9. (a) Two random samples from two normal populations are given below :

Sample I :	16	26	27	23	24	22
Sample II :	33	42	35	32	28	31

Do the estimates of population variances differ significantly ?

(b) In an experiment on immunization of cattle from tuberculosis, following results were obtained :

	Affected	Unaffected
Inoculated	12	26
Not Inoculated	16	06

Examine the effect of vaccine in controlling susceptibility to tuberculosis. 15