

CBCS Scheme

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15BT41

Fourth Semester B.E. Degree Examination, June/July 2018 Biostatistics and Biomodelling

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of statistical tables may be permitted.

Module-1

- 1 a. Draw two Ogive curves for the following distribution showing the number of marks of 59 students given that

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of students	4	8	11	15	12	6	3

(06 Marks)

- b. Find the mean deviation from the median of the following frequency distribution.

Mid value of C.I (x)	5	15	25	35	45
Frequency	5	8	15	16	6

(05 Marks)

- c. Find Karl Pearson's coefficient of Skewness given that

Branches	8	11	14	17	20	23
No. of plants	2	4	6	10	6	3

(05 Marks)

OR

- 2 a. Obtain the PIE chart for the values given below

Sl No.	1	2	3	4	5	6	7
Item	Food	Housing	Clothing	Education	Entertainment	Savings	Miscellaneous
% Expenditure	50	10	10	10	5	10	5

(06 Marks)

- b. Find the coefficient of variation for the data of plants varieties,

G – 65 (variety)	27	9	8	5	4
PS – 16 (variety)	17	9	6	5	3

(05 Marks)

- c. In a frequency distribution the coefficient of skewness based on quartiles is 0.6. If the sum of the upper and lower quartiles is 100 and the median is 38, find the value of the upper quartile.

(05 Marks)

Module-2

- 3 a. Calculate the coefficient of correlation given that

Plants	12	9	8	10	11	13	7
Type of flowers in numbers	14	8	6	9	11	12	3

(06 Marks)

- b. Table shows the diastolic blood pressures (y) at various time periods (x). Find regression line y on x and x on y, given that

x	0	5	10	15	20
y	72	67	70	65	66

(05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Fit a straight line $y = a + bx$ to the following data by the method of least squares given that

x	0	1	3	6	8
y	1	3	2	5	4

(05 Marks)

OR

- 4 a. Two judges in a beauty contest rank the twelve entries as shown in the table, find the coefficient of rank correlation, given that

Rank by Judge - I	1	2	3	4	5	6	7	8	9	10	11	12
Rank by Judge - II	12	9	6	10	3	5	4	7	8	2	11	1

(06 Marks)

- b. Regression equation are given by $8x - 10y + 66 = 0$ and $40x - 18y = 214$, the variance of x is 9, find :

- mean of x and mean of y
- correlation coefficient and
- standard deviation of y .

(05 Marks)

- c. Fit an exponential curve $y = ae^{bx}$ to the following data :

x	2	4	6	8
y	25	38	56	84

(05 Marks)

Module-3

- 5 a. State Baye's rule. Assume that a factory has two machines M_1 and M_2 . M_1 produces 30% of the articles, of which 5% are defective and M_2 produces 70% of the articles, of which 1% are defective. What is the probability that an article is selected at random which is from M_2 ?

(06 Marks)

- b. Explain Hardy - Weinberg law with a reference to dominants, hybrids and recessives.

(05 Marks)

- c. If x be the continuous random variable with p.d.f given by

$$f(x) = \begin{cases} ax, & 0 \leq x \leq 1 \\ a, & 1 \leq x \leq 2 \\ -ax + 3a, & 2 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

Find : (i) the value of a
and (ii) $P(x \leq 1.5)$

(05 Marks)

OR

- 6 a. Define conditional probability with suitable equation. Two cards are drawn one after the other without replacement, what is the probability that (i) drawing two Aces and (ii) drawing two spades.

(06 Marks)

- b. Discuss briefly on the multiple alleles and the possibilities of groups for genotypes and phenotypes.

(05 Marks)

- c. The probability density function of variate x is

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

Then find: (i) $P(X < 4)$, (ii) $P(X \geq 5)$, $P(3 < X \leq 6)$.

(05 Marks)

Module-4

- 7 a. Prove that the constants of Binomial distribution as (i) mean (\bar{x}) = np and (ii) standard deviation (σ) = \sqrt{npq} . (06 Marks)
- b. A distributor of bean seeds determines from extensive tests that 5% of large batch of seeds will not germinate. He sells the seeds in packets of 200 and guarantees 90% germination. Determine the probability that a particular packet will violate the guarantee. (Use Poisson distribution). (05 Marks)
- c. Define exponential distribution and establish the equations for (i) mean and (ii) variance. (05 Marks)

OR

- 8 a. The probability of recovery from some infection is 0.4. Five children are found to be with such infection. Find the probability that :
(i) Five will recover (ii) Four will recover (iii) Four or more will recover.
Using Binomial distribution. (06 Marks)
- b. The mean yield for one acre plot is 662 kg with standard deviation 32kg. Assuming normal distribution how many one acre plots in a batch of 1000 plots would you expect to have yield (i) over 700 kgs and (ii) below 650 kgs. (05 Marks)
- c. Mean serum vitamin A level of 10 students was 22.0 (mg/dℓ) with a variance of 40. Does this mean value differ from a mean value of 25 (mg/dℓ) observed in another study? ($t_{0.05} = 2.26$ at 5% level of significance for 9 d.f, the table value). (05 Marks)

Module-5

- 9 a. In a Mendelian experiment on breeding four types of plants are expected to occur in the proportions 9 : 3 : 3 : 1. The observed frequencies are 891 round and yellow, 316 wrinkled and yellow, 290 round and green and 119 wrinkled and green. Find the chi-square and examine the correspondence between theory and experiment (Table value = 7.80 for $t_{0.05}$ for 3 d.f). (06 Marks)
- b. Explain the microbial growth in chemostat using suitable equations. (Indicate suitable diagram). (05 Marks)
- c. Discuss Lotka – Volterra's model for n interacting species with suitable equations with a reference to prey predator species. (05 Marks)

OR

- 10 a. Explain in brief :
i) Interval estimation
ii) One way classification in Analysis of variance
iii) Replication in design of experiments. (06 Marks)
- b. In a sample of 8 observations, the sum of the squared deviations of items from the mean was 94.5. In another sample of 10 observations, the value was found to be 101.7. Test whether the difference is significant at 5% level of significance. (Table value $F_{0.05} = 3.29$ at (7, 9) df). (05 Marks)
- c. Define:
(i) Infectives I(t)
(ii) Susceptibles S(t) in the case of epidemics.
Establish the equation for Infectives I(t) using suitable assumptions. (05 Marks)
