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Your Roll No.....

Sr. No. of Question Paper : 1600 **G**

Unique Paper Code : 3182012303

Name of the Paper : Biostatistics

Name of the Course : **B.Sc. (Hons) Biomedical Science (NEP-UGCF-2022)**

Semester : III

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. **1** is compulsory.
4. Subparts of the questions should be attempted together.
5. Use of simple/non-programmable scientific calculators is allowed.
6. Statistical and log tables will be provided.

P.T.O.

1. (a) Briefly explain the following **(any 5)** (2×5=10)

(i) Parameter

(ii) Type I error

(iii) Nominal data

(iv) Normal distribution

(v) ANOVA

(vi) Central limit theorem

(vii) Sign test

(b) What is skewness? Explain its different types with the help of graphs. (4)

(c) How are mutually exclusive events different from independent events? Briefly explain with suitable examples. (4)

2. (a) A single 100-rng dose of a drug is administered orally to 15 adults. The time (in minutes) required by the drug to reach maximum concentration in the blood is recorded as follows: 12, 12, 16, 10, 13, 12, 14, 13, 19, 13, 13, 14, 16, 15, 14

Calculate the three measures of central tendency, D_3, P_{25}, Interquartile Range and Variance for the above mentioned data. (12)

(b) In a study concerning the blood pressure of 60 year old women with glaucoma, 200 women with glaucoma were randomly selected. The sample mean systolic blood pressure was found to be 140 mm Hg and standard deviation as 25 mm Hg. Calculate 95% confidence interval for the true mean systolic blood pressure among this population of women with glaucoma. Interpret your result if the mean systolic blood pressure for normal women of this age is 120 mm Hg. (6)

3. (a) For ten states in India, an index of arsenic exposure X and the cancer mortality Y (deaths per 100,000 persons for 1990) were calculated as given in the table.

Is there any evidence of a relationship between arsenic exposure and cancer mortality?

Find the regression line of X on Y. Estimate the cancer mortality (Y) associated with arsenic exposure index value of 8.0. (12)

State	Arsenic Exposure (X)	Cancer Mortality (Y)
A	8.3	210
B	6.4	180
C	3.4	130
D	3.8	170
E	2.6	130
F	11.6	210
G	1.2	120
H	2.5	150
I	1.6	140
J	3.5	150

(b) In a population, the average IQ is 100. A team of scientists want to test a new medication to see if it has any effect on intelligence or not. A sample of 25 participants who have taken the medication for a 'desired duration, recorded a mean IQ of 130 with standard deviation of 20. Did the medication affect intelligence? Justify the selection of the statistical test used to draw your conclusion.

(6)

4. (a) In an anti malaria campaign in a certain area, quinine was administered to 170 persons out of a total population of 250. The number of fever cases are shown below. Check whether quinine usage is

associated with controlling malaria. Check at significance level 0.05. Justify the selection of the statistical test used. (9)

Treatment	Fever (F)	No fever (f)	Total
Quinine (Q)	140	30	170
No Quinine (q)	60	20	80
Total	200	50	250

(b) What is the OR rule of probability? Explain with the help of an example. An office has 60 female and 40 male employees, out of which 24 females and 16 males wear eyeglasses. What is the probability that an employee picked at random

(i) will be a male and wear eyeglasses,

(ii) will wear eyeglasses given that the employee is a male,

(iii) will be a female given that the employee wears eyeglasses (9)

5. (a) The weights of a certain population of young adult females are approximately normally distributed

with a mean of 132 pounds and a standard deviation of 15. Find the probability that a subject selected at random from this population will weigh :

(i) More than 155 pounds

(ii) 100 pounds or less

(iii) Between 105 and 145 pounds

(iv) More than 120 pounds (9)

(b) Based on data, an estimate of adults who have hypertension is 24%. If we select a simple random sample of 20 adults, find the probability that the number of people in the sample who have been told that they have hypertension will be:

(i) Exactly three

(ii) Three or more

(iii) Fewer than three

(iv) Between three and seven (both inclusive)

(9)

6. (a) A research team wished to evaluate a proposed screening test for a neurological disease. Assume that the rate of the disease in the general population is 10%. The test was given to a random sample of 400 patients with the disease and an independent random sample of 600 patients without symptoms of the disease. The two samples were drawn from populations of subjects who were 75 years or older. The results are as follows :

	Disease	No Disease	Total
Positive Result	350	10	360
Negative Result	50	590	640
Total	400	600	1000

Calculate the specificity and sensitivity of the test. What is the predictive value positive of the symptom and the predictive value negative of the symptom? (12)

(b) In an air pollution study, a random sample of 200 families was selected from each of two communities. A person in each family was asked whether or not anyone in the family was affected

by air pollution. Based on the following responses, can the researchers conclude that the two communities differ with respect to the variable of interest? (6)

	Family member affected by Air Pollution	Family member not affected by Air Pollution	Total
Community I	43	157	200
Community II	81	119	200
Total	124	276	400