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$\left[\frac{51}{A-25} \right]$

($\frac{51}{A-25}$) Sardar Patel University
M. Sc. Integrated Biotechnology (IGBT) - 2nd Semester
Theory examination, April, 2016
Saturday, 09th April, 2016; Time: 10:30 a.m. to 1:30 p.m.
Subject: PS02CIGB06: Biostatistics

Total Marks: 70

- Notes: - 1) Figures to the right indicate marks.
 2) Draw neat and labeled diagram, wherever necessary.

Q.1 Choose the Correct Answers of the Following. [08]

1. _____ central tendency measure is used to calculate mean of percentages, rates and ratios.
 - (a) Weighted arithmetic mean
 - (b) Non-paired arithmetic mean
 - (c) Paired arithmetic mean
 - (d) Square of arithmetic mean
2. If the arithmetic mean of 30 values is 10, then sum of these 30 values is:
 - (a) 30
 - (b) 3000
 - (c) 300
 - (d) 03
3. A bag contains 10 green balls and 8 blue balls. A ball is drawn at random. The probability that ball drawn is green is _____.
 - (a) 1
 - (b) 5/9
 - (c) 4/5
 - (d) 3/18
4. For mutually exclusive events A and B, which of the following is always true?
 - (a) $P(A \cup B) = P(A) \times P(B)$
 - (b) $P(A \cap B) = P(A) + P(B)$
 - (c) $P(A \cup B) = P(A) + P(B)$
 - (d) $P(A \cap B) = P(A) \times P(B)$
5. The degree of freedom for paired t-test based on n pairs of observations is:
 - (a) $2n - 1$
 - (b) $n - 2$
 - (c) $2(n - 1)$
 - (d) $n - 1$
6. If H_0 is true and we reject it is called:
 - (a) Type-I error
 - (b) Type-II error
 - (c) Standard error
 - (d) Sampling error
7. If both variables X and Y increase or decrease simultaneously, then the coefficient of correlation will be:
 - (a) Positive
 - (b) Negative
 - (c) Zero
 - (d) One
8. What do ANOVA calculate?
 - (a) Z-scores
 - (b) Chi square
 - (c) R ratios
 - (d) F ratios

Q.2 Answer the following in short. (Attempt Any Seven) [14]

1. Write merits and demerits of Mean.
2. Narrate the significance of graphic representation of data.
3. In a moderately skewed distribution, Mean=45 and Median=30, then the calculate mode.
4. State addition rule and multiplication rule for probability.
5. A card is drawn at random from a well shuffled pack of cards. What is the probability that the card is a spade or a queen?
6. Write about types of errors in testing of hypothesis.
7. Narrate the applications of Chi-square test.

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6. If H_0 is true and we reject it is called:
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7. If both variables X and Y increase or decrease simultaneously, then the coefficient of correlation will be:
(a) Positive (b) Negative (c) Zero (d) One
8. What do ANOVA calculate?
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6. Write about types of errors in testing of hypothesis.
7. Narrate the applications of Chi-square test.

8. Represent types of correlation with scatter diagram.
9. Write properties of regression coefficient.

Q.3 (A) Calculate the mean and standard deviation from the following data of presence of urea in the blood samples of 520 patients in a hospital : [06]

Range (mg/dl)	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of Patients	20	26	44	60	101	109	84	66	10

Q.3 (B) Find mean, median and mode of the following data: [06]

x	15-25	25-35	35-45	45-55	55-65	65-75	75-85
f	30	40	100	110	80	30	10

OR

Q.3 (B) Calculate the arithmetic mean, geometric mean, harmonic mean from the following data recorded on total chlorophyll content of leaf: [06]

Total chlorophyll (mg./leaf) = 1.20, 1.25, 1.75, 2.10, 1.80, 1.60, 1.70, 1.85, 1.90, 1.95

Q.4 (A) Write the statement of Baye's theorem. The new pregnancy test was given to 100 pregnant women and 100 non-pregnant women. The test indicated pregnancy of 92 of 100 pregnant and to 12 of the 100 non-pregnant women. If a randomly selected woman takes this test and the test indicates that she is pregnant. What is the probability that she was not pregnant? [06]

Q.4 (B) The probability that an infection is cured by a particular antibiotic drug within 5 days is 0.75. Suppose four patients are treated by this antibiotic drug. What is the probability that (i) no patient is cured (ii) exactly one patient is cured (iii) exactly two patients are cured. [06]

OR

Q.4 (B) Write the addition theorem for compatible events. Two students X and Y work independently on a problem. The probability that X will solve it is $(3/4)$ and the probability that Y will solve it is $(2/3)$. What is the probability that the problem will be solved? [06]

Q.5 (A) The average number of articles produced by two machines per day are 200 and 250 with standard deviations 20 and 25 respectively on the basis of records of 25 days production. Can you regard both the machines equally efficient at 1% of significance? [06]

[Tabulated $t_{0.01}(48 \text{ d.f.}) = 2.58$]

- Q.5 (B)** An I.Q. test was administered to 5 medical representatives before and after they were trained. The results are given below: [06]

Candidate No.	1	2	3	4	5
I.Q. before training	110	120	123	132	125
I.Q. after training	120	118	125	136	121

Test whether there is any change in I.Q. after the training. [Tabulated $t_{0.01}=4.6$ for d.f. 4]

OR

- Q.5 (B)** In a mendelian experiment on breeding, four types of plants are expected to occur in the proportion of 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 value and examine the correspondence between the theory and the experiment. [06]

[Tabulated ' χ^2 ' value 7.80 at 5% level of probability for Three degree of freedom]

- Q.6 (A)** Calculated the coefficient of correlation between X and Y variables from the following data: [06]

X	50	55	65	64	60	63	62	61	65	70
Y	110	112	117	120	110	112	113	112	121	125

Interpret your results with the level of significance. [Tabulated 't' value at 5% (2.31) levels of probability with d.f.=8]

- Q.6 (B)** Height (inches) and weight (kgs.) are recorded for 10 students. The results are given below. Calculate the regression coefficient and test the level of significance. [Tabulated 't' value at 1% (3.36) levels of probability with d.f.=8] [06]

Height (inches)	62	72	78	58	65	70	66	63	60	72
Weight (kgs.)	50	65	63	50	54	60	61	55	54	65

OR

- Q.6 (B)** The fluoride content of water was measured at three different stations of a lake. The seasonal averages of fluoride in mg/l are given below. Apply tow factor analysis of variance and interpret your results. [06]

Season	Fluoride content of water (mg/l)		
	Stations		
	A1	A2	A3
Summer	187.4	341.8	240.6
Monsoon	172.9	198.2	150.2
Winter	154.3	157.4	137.1

[Tabulated F value = 6.9 at 5% level of significance]
