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SEAT No. \_\_\_\_\_

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**SARDAR PATEL UNIVERSITY**

**M.Sc. Examination - March 2019**

**M. Sc. Genetics - 2<sup>nd</sup> Semester**

**Saturday, 30<sup>th</sup> March 2019**

**Session: Evening Time: 02:00 pm to 05:00 pm**

**Subject / Course Code: - PS02EGEN21**

**Subject / Course Title: - Biostatistics**

**Maximum Marks: 70**

**Note:** (1) All the Questions are compulsory. (2) Figures on the right indicate marks.  
(3) Use of Simple / Scientific calculator is allowed. (4) Statistical table will be provided on request.

**Q.1** Choose the correct option

**1 × 8 = 8**

- (i) The sum of the percent frequencies for all classes will always equal \_\_\_\_\_.  
[A] 1 [B] Number of items in study  
[C] Number of classes [D] 100
- (ii) In stem & leaf display diagrams used in exploratory analysis, stems are considered as \_\_\_\_\_.  
[A] Central digits  
[B] Trailing digits  
[C] Leading digits  
[D] Dispersed digits
- (iii) Largest numerical value is 45 and smallest numerical value is 25 and classes desired are 4 then width of class interval is \_\_\_\_\_.  
[A] 45 [B] 5  
[C] 65 [D] 17.5
- (iv) A random variable may be \_\_\_\_\_.  
[A] fixed [B] continuous  
[C] discrete [D] discrete or continuous
- (v) Dr. Bhavin is using a t-test to compare the means of two groups. There are 25 participants in each group. How many degrees of freedom are there in this test?  
[A] 23 [B] 24  
[C] 48 [D] 49
- (vi) Consider the following probability distribution:  
$$P(x) = \binom{10}{x} (0.3)^x (0.7)^{10-x}, x = 0, 1, \dots, 10$$
  
The standard deviation of X is \_\_\_\_\_.  
[A] 2.10 [B] 1.45  
[C] 0.21 [D] None of these
- (vii) Which of the following samples sizes the standard error of the distribution of means be the smallest?  
[A] 1 [B] 200  
[C] 100 [D] 42
- (viii) If the correlation coefficient  $r = 0.5$ , then the coefficient of determination is \_\_\_\_\_.  
[A] 0.10 [B] 1.00  
[C] 0.25 [D] 2.50

(1)

(P.T.O.)

Q.2. Attempt any seven of the following

2 × 7 = 14

- (i) Define the term simple random sampling.
- (ii) Write note on scatter plot (diagram).
- (iii) Define variance. Calculate variance to given data 25, 30, 35, 40, 45.
- (iv) Define the term Kurtosis and types of kurtosis.
- (v) Explain various types of ogives used in statistics.
- (vi) Write down the regression equation, which could be used to predict value of Y for any given value of X. Write down the formula for each term in the equation.
- (vii) Give Statement of multiplicative theorem or theorem on compound probability.
- (viii) Define the binomial distribution. State the conditions for applicability of binomial distribution.
- (ix) What are Type I and Type II errors in probability

Q.3. (A) Following are the Hemoglobin (g%) contents of 66 students. Prepare frequency distribution table using *Sturge's* rule & calculate arithmetic mean & standard deviation. [6]

13.9	12.5	13.5	8.5	13.5	15.9	12.0	7.1	10.5	12.1	10.9
12.0	12.9	8.3	9.6	11.7	13.0	14.9	15.9	10.8	12.9	12.5
14.9	14.6	14.7	14.8	15.2	12.1	11.8	12.9	11.5	11.2	11.7
11.8	12.5	11.5	11.0	12.1	13.2	13.5	11.7	7.2	14.3	11.2
13.5	7.1	7.2	9.2	9.6	9.9	10.2	8.8	12.1	13.8	12.3
10.2	10.7	13.5	14.0	8.7	9.1	9.2	9.0	9.3	12.3	9.4

(B) Calculate the Arithmetic mean, mode and median for the following data: [6]

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	5	9	13	21	20	17	7	3

OR

Q.3. (B) Find coefficient of skewness using Bowley's formula. [6]

Class	40-50	50-60	60-70	70-80	80-90	90-100	100-110
Frequency	3	5	10	8	4	4	1

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Q. 4. (A) Total fingerprint ridge count in humans is approximately normally distributed with mean of 140 and standard deviation of 50. Find the probability that an individual picked at random will have a ridge count less than 100. [Write the details of the steps to find the solution with sketch of normal curve]. [6]

(B) (i) In a binomial distribution, the mean & standard deviation are 12 & 2 respectively. Find  $n$  and  $p$ . [3]

(ii) Out of 1000 families of 3 children each, how many families would you expect to have two boys and one girl assuming that boys and girls are equally likely? [3]

OR

Q. 4. (B) The marks obtained in certain examination follow normal distribution with mean 45 and standard deviation 10. If 1000 students appeared at the examination, calculate the number of students scoring (i) less than 40 marks and (ii) more than 60 marks. [6]

Q. 5. (A) Rahul's parents recorded his height at various ages up to 84 months. [6]

Age (Months)	12	24	36	48	60	72	84
Height (inches)	29	32	35	38	41	43	45

(i) Compute  $r$ , the Karl Pearson's Correlation coefficient and comment on it.

(ii) Predict the height at the age of 8 years.

(B) Ten students got the following percentage of marks in Biology and Biostatistics are as follows: [6]

Biology	8	36	98	25	75	82	92	62	65	35
Biostatistics	84	51	91	60	68	62	86	58	35	49

Find the Spearman's rank correlation coefficient.

OR

Q. 5. (B) To determine the possible effect of chemical treatment on the rate of seed germination, 300 chemically treated seeds and 400 untreated seeds are sown. The number of seeds that germinated is recorded. [6]

	Germinated	Not Germinated
Treated	250	50
Untreated	390	60

On the basis of these data can it be concluded that the chemical treatment is effective in germination of seeds [1 d.f., the value of chi square  $(\chi^2)_{0.005} = 3.84$ ]

(B)

- Q. 6. (A) An I.Q. test was administered to 5 students before and after they were given the nourishing food, ProCarb. The results are given below: [6]

Candidates	I	II	III	IV	V
I.Q. Before ProCarb	110	120	123	132	125
I.Q. After ProCarb	120	118	125	136	121

Test whether there is any change in I.Q. after the Procarb (nourishing food).

(For  $\nu = 4$ ,  $t_{0.05/2}$  is 2.776)

- (B) Three Maize varieties were sown in 5 plots each and following yield in quintals per acre were obtained. Perform ANOVA and find out whether there is significant difference between mean yields of three varieties. [6]

[ $F_{crit}$  value [ $\alpha$ ;  $c-1$ ,  $c(r-1)$ ] at  $\alpha = 0.05$  is 3.88]

Plots	Sample A	Sample B	Sample C
1	20	19	13
2	10	13	12
3	17	17	10
4	17	13	15
5	16	09	05

OR

- Q. 6. (B) Random samples are drawn from two populations and the following results were obtained regarding their blood cholesterols: [6]

Sample X	16	17	18	19	20	21	22	24	26	27		
Sample Y	19	22	23	25	26	28	29	30	31	32	35	36

Find the variance of two populations and test whether the two samples have same variance. (The  $F_{0.05}$  for  $V_2 = 11$ ,  $V_1 = 9$  is 3.10)

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