CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
First & Third Semester of BSc Physics Examination November 2019
PD107 Statistics-I

Date:09/11/2019,Saturday **Time:10:00 a.m. to 10:30 a.m.** **Maximum Marks:20**

MCQ

Important Instructions:

- Tick the correct answer/s and it should be written in question paper itself.
- Use of non-programmable calculator is allowed.

Q - I Choose the correct answer for the following questions.

1. A discrete variable may take the values in a set _____.

(i) $\{0,1,2,3,\ldots\}$ **(iii)** {male,female}

(ii) $[0,+\infty)$ **(iv)** {Grade A,Grade B,Grade C}

2. The quartile Q_1 of the data $6,7,9,9,11,12,15$ is _____

(i) 6 **(iii)** 9

(ii) 12 **(iv)** 7

3. The sum of 6 numbers is 72. The arithmetic mean of these numbers is _____.

(i) $6/72$ **(iii)** $72/6$

(ii) $72+6$ **(iv)** 72×6

4. The median of the numbers $5,7,10,11,9,9,12$ is _____.

(i) 7 **(iii)** 12

(ii) 9 **(iv)** 11

5. If the sum $(4-a)+(9-a)+(5-a)=0$, then the value of a is_____

(i) 6 **(iii)** 18

(ii) 0 **(iv)** 9

6. The sample standard deviation of the numbers $-1,0,1$ is _____.

(i) 0 **(iii)** $\sqrt{2/3}$

(ii) $\sqrt{1/3}$ **(iv)** 1

7. The harmonic mean of two numbers is $36/6.5$ and their Geometric mean is 6. The two numbers are _____.

(i) $8,5$ **(iii)** $7,6$

(ii) $4,9$ **(iv)** $3,10$

8. Range of observations in a set is 65 and maximum observation is 83.The minimum observations of this set is _____.

(i) 74 **(iii)** 18

(ii) 9 **(iv)** can not be determined

9. The correct relation between variance and standard deviation SD of variable X is _____.

(i) SD = $[\mathrm{Var}(X)]^2$ **(iii)** SD = $\sqrt{\mathrm{Var}(X)}$

(ii) SD = $[\mathrm{Var}(X)]$ **(iv)** SD = $\dfrac{1}{[\mathrm{Var}(X)]^2}$

10. If $x_1=2, x_2=4, x_3=2$,then $\sum_{i=1}^{3} x_i^2 =$ _____.

(i) 24 **(iii)** 8

(ii) 64 **(iv)** 16

11. If the simple correlation coefficient between variables X and Y respectively is $r=0.6$, then simple correlation coefficient between variables X and $-2Y$ respectively is _____

(i) 0.6 **(iii)** -0.3

(ii) 0.3 **(iv)** -0.6

12. Which of the following values could not represent a linear correlation coefficient? _____..

(i) 0.89 **(iii)** -0.67

(ii) 1.02 **(iv)** -1.0

13. In study of the attributes A,α,B,and β, the class frequency $f_A =$ _____.

(i) $f_{\alpha B}+f_{\alpha B}$ **(iii)** $f_{AB}+f_{\alpha B}$

(ii) $f_{AB}+f_{A\beta}$ **(iv)** $f_{AB}+f_{\alpha\beta}$

14. The variable X in regression equation $Y = \beta_0 + \beta_1 X + \varepsilon$ is known as _____.

(i) response variable

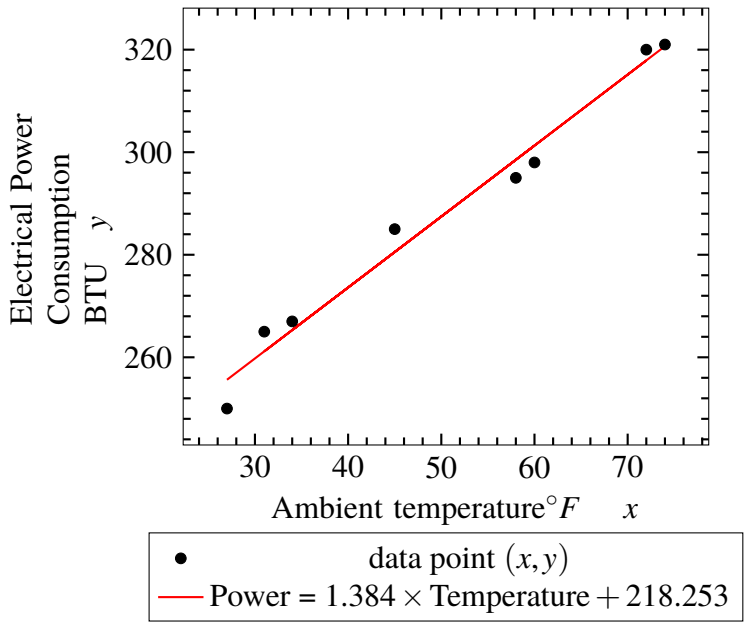
(ii) dependent variable

(iii) independent variable

(iv) output (outcome) variable

For questions **15.** to **17.**: An experiment was designed to study the effect of ambient temperature x on the electric power consumed by a chemical plant y.The following diagram represents scatter diagram and regression line of the data obtained in experiment.

Scatter diagram and regression line



15. From the diagram the slope of the regression line is _____.

(i) 1.384

(ii) 218.253

(iii) 50

(iv) 280

16. From the diagram the relationship between power consumption and ambient temperature is _____.

(i) linear and negative

(ii) non-linear and positive

(iii) non-linear and negative

(iv) linear and positive

17. The estimate of the power consumption for an ambient temperature of $65°F$= _____.

(i) 300

(ii) 308.21

(iii) 283.253

(iv) 218.253

18. Suppose $u_1, u_2, \ldots, u_n$ and $v_1, v_2, \ldots, v_n$ are the ranks assigned to two characters A and B (without ties), and assume that $u_i = v_i, i = 1, 2, \ldots, n$. Then the spearmen rank correlation $r_R =$ _____.

(i) $+\infty$ **(iii)** 0

(ii) -1 **(iv)** $+1$

19. The value of Spearman's rank correlation coefficient lies within _____.

(i) -1 to $+1$ **(iii)** 0 to $+\infty$

(ii) 0 to $+1$ **(iv)** $-\infty$ to $+\infty$

20. Consider the values of variables x and y given as

x :	1	2	3	4
y :	2	4	6	8

Therefore the simple correlation coefficient $r_{xy} =$ _____.

(i) 0 **(iii)** 1

(ii) -1 **(iv)** 2

End of **MCQ**

Candidate seat no:_____

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PD107 Statistics-I

Date:09/11/2019,Saturday **Time:10:30 a.m. to 01:00 p.m.** **Maximum Marks:50**

Instructions:
- **Section I and II must be attempted in TWO ANSWER SHEET**.
- Make suitable assumptions and draw neat figures wherever required.
- Use of non-programmable calculator is allowed.
- Show necessary calculations.

SECTION I

Q - II Answer the following questions as directed. **[20]**

1. Define the following terms. **[08]**
(a) Arithmetic Mean and Mode. (b) Coefficient of skewness based on moments.
(c) Variance and standard deviation. (d) Spearman's rank correlation.

2. Attempt any three questions. **[12]**

(i) A researcher made many series of measurements of the speed of light. Using a revolving mirror technique, he obtained for the differences (velocity of light in air) - (229,700) km/s

Table 1

12	30	30	27	30	39	18	27	48	24	18

Compute (a) median and (b) arithmetic mean

(ii) An electric engineer monitored the flow of current in a circuit by measuring the flow of electrons and the resistance of the medium. Over 11 hours, she observed a flow of amperes as shown in Table (2)

Table 2

5	12	8	16	13	10	9	11	14	7	8

Compute (a) standard deviation (b) all quartiles

(iii) Physicists, trying to learn about neutrinos, detected twelve of them coming from a supernova outside of our solar system. The times (seconds) between the arrivals are presented in their original order.

Table 3: ordered interarrival times (seconds)

0.021	0.107	0.179	0.19	0.196	0.283	0.58	0.854	1.18	2.0	7.3

compute (i) all quartiles (ii) coefficient of skewness based on quartiles obtained by you.

(iv) Suppose $u_1 = 1, u_2 = 2, \ldots, u_n = n$ and $v_1, v_2, \ldots, v_n$ are the ranks assigned to two characters A and B (without ties), and assume that $v_i = n - u_i + 1, i = 1, 2, \ldots, n$. Show that the Spearman rank correlation coefficient is equal to -1.

SECTION II

Q - III Answer the following questions as directed. **[30]**

1. Write brief note on following **[12]**

(i) Mathematical properties of simple linear regression coefficients.

(ii) Relationship between simple correlation and partial correlation of variables X_1, X_2 and X_3

(iii) Relation between class frequencies in study of three attributes A,B and C

2. Attempt any three questions. **[18]**

(i) The data below pertains to the number of hours a laptop has been charged for and the number of hours of backup provided by the battery.

Table 4

Charged for(hours) x	0.5	1.0	1.5	2.0	2.5
Battery backup(hours) y	0.75	1.75	2.50	4.50	6.00

Find the equation of regression line to estimate the mean battery backup time at $x = 3$ hours.

(ii) Electric and hybrid cars require NI-MN batteries having a high capacity. Battery capacity decreases as the rate of discharge increases. Let y = battery capacity, measured in amp-hours, and x = rate of discharge in amps. Suppose tests of six NI-MN batteries, of the same model produce the results

Table 5

Rate of discharge x	2	3	6	10	15	20
Capacity (Ah) y	164.7	156.1	142.5	133.8	114.6	107.1

Fit the curve of the form $y = \alpha e^{\beta x}$. Use the method of least squares.

(iii) Given the following ultimate class frequencies find the frequencies of positive class. $f_{(ABC)} = 149, \quad f_{(\alpha BC)} = 204, \quad f_{(AB\gamma)} = 738, \quad f_{(\alpha B\gamma)} = 1762$
$f_{(A\beta C)} = 225, \quad f_{(\alpha\beta C)} = 171, \quad f_{(A\beta\gamma)} = 1196, \quad f_{(\alpha\beta\gamma)} = 21842.$
The whole number of observations $N = 26287$

(iv) The total correlation between the variables x_1,x_2,x_3 are given as
$r_{12} = 0.77, r_{13} = 0.72$ and $r_{23} = 0.52$.
Determine the multiple correlation $R^2_{1.23}$ and partial correlation $r_{12.3}$.