

(6)

$$1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

where d_i denotes the difference between the ranks of an individual. Modify the formula when in ranks are equal. 2+3

12. An employment bureau asked applicants their weekly wages on jobs last held. The actual wages were obtained for 54 of them and are recorded in the table below; x represents reported wage, y actual wage and the entry in the table represents frequency. Find the correlation coefficient between x and y .

$\begin{array}{c} y \\ \swarrow \searrow \\ x \end{array}$	15	20	25	30	35	40
40						2
35				3	5	
30			4	15		
25			20			
20		3	1			
15		1				

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Ex./UG/Sc/GE-1/50/2019

BACHELOR OF SCIENCE EXAMINATION, 2019
(1st Year, 1st Semester)

MATHEMATICS

Statistics - I

Paper : GE - 01

Time : Two hours

Full Marks : 50

Use a separate answer script for each part.

PART - I (25 marks)

Answer *question no. 1* and any *three* from the rest.

- Attempt all questions :
 - What are the chances that no two boys are sitting together for a photograph if there are 5 girls and 2 boys?
(a) $1/21$ (b) $4/7$ (c) $2/7$ (d) $5/7$
 - What is probability of drawing two clubs from a well shuffled pack of 52 cards?
(a) $13/51$ (b) $1/17$ (c) $1/26$ (d) $13/17$
 - When two coins are tossed simultaneously, what are the chances of getting at least one tail?
(a) $3/4$ (b) $1/5$ (c) $4/5$ (d) $1/4$

(Turn over)

(2)

- (iv) In a drawer there are 4 white socks, 3 blue socks and 5 grey socks. Two socks are picked randomly. What is the possibility that both the socks are of same color ?
(a) 4/11 (b) 1 (c) 2/33 (d) 19/66
- (v) In a drawer there are 5 black socks and 3 green socks. Two socks are picked randomly one after the other without replacement. What is the possibility that both the socks are black ?
(a) 5/14 (b) 5/8 (c) 3/8 (d) 5/16
- (vi) What is the possibility of having 53 Thursdays in a non-leap year ?
(a) 6/7 (b) 1/7 (c) 1/365 (d) 53/365
- (vii) A box has 5 black and 3 green shirts. One shirt is picked randomly and put in another box. The second box has 3 black and 5 green shirts. Now a shirt is picked from second box. What is the probability of it being a black shirt ?
(a) 4/9 (b) 29/72 (c) 8/72 (d) 3/16
- (viii) On rolling a dice 2 times, the sum of 2 numbers that appear on the uppermost face is 8. What is the probability that the first throw of dice yields 4 ?
(a) 2/36 (b) 1/36 (c) 1/6 (d) 1/5
- (ix) A box has 6 black, 4 red, 2 white and 3 blue shirts. What is probability of picking at least 1 red shirt in 4 shirts that are randomly picked ?
(a) 4/15 (b) 24/455 (c) 69/91 (d) 22/91

(5)

8. If for a random variable x , the absolute moment of order k exists for ordinary $k = 1, 2, \dots, n$, then prove that the following inequalities
- (i) $\beta_k^2 \leq \beta_{k-1} \beta_{k+1}$ (ii) $\beta_k^{1/k} \leq \beta_{k+1}^{1/(k+1)}$
- hold for $k = 1, 2, 3, \dots, n-1$, where β_k is the k th absolute moment about the origin.
9. (a) Show that
- (i) sum of absolute deviations about median is least,
(ii) sum of squares of deviations about arithmetic mean is least.
- (b) Prove that for any frequency distribution, standard deviation is not less than mean deviation from mean. 3+2
10. Find the mean and central moments of arbitrary order n for the normal distribution with parameters μ and σ . Also find the coefficient of skewness and kurtosis for this distribution. 4+1
11. Prove that Spearman's rank correlation coefficient is given by

(Turn over)

(4)

PART - II (25 marks)

Answer any *five* questions.

6. The following shows the distribution of some families according to their expenditure per week : Number of families corresponding to expenditure groups Rs. (100–200) and Rs. (300–400) are missing from the table. The median and mode are given to be Rs. 250 and Rs. 240 respectively. Calculate the missing frequencies and then arithmetic mean of the data.

Expenditure	0-100	100-200	200-300	300-400	400-500	
No. of families	14	?	27	?	15	5

7. Find out the mean deviation from mean, standard deviation, quartile deviations from the following table.

Wages in Rs.	No. of labours
Above 0	685
Above 10	500
Above 20	423
Above 30	389
Above 40	209
Above 50	73
Above 60	50
Above 70	0

5

(3)

- (x) A box has 6 black, 4 red, 2 white and 3 blue shirts. What is the probability that 2 red shirts and 1 blue shirt get chosen during a random selection of 3 shirts from the box ?
 (a) 18/455 (b) 7/15 (c) 7/435 (d) 7/2730

2. A coin has Probability $\frac{3}{4}$ of showing a Head. If it is tossed independently and repeatedly unless 3 Heads come up. As soon as 3 Heads come up, the process is stopped and the no. of tossed X noted. Find the mean of X.
3. A continuous random variable has probability density function given by :

$$f(x) = \begin{cases} c \cdot x, & \text{if } 0 \leq x \leq \frac{1}{2} \\ x^2, & \text{if } \frac{1}{2} < x \leq 1 \end{cases}$$

where c is a real constant.

Evaluate c and find the mean of this random variable.

4. State and prove Chebyshev's Inequality.
5. Prove that,

$$P\left(\bigcup_{i=1}^n A_i\right) \leq \sum_{i=1}^n P(A_i)$$

(Turn over)