U.G. 6th Semester Examinations 2022

MATHEMATICS (Honours)

Paper Code : SEC - 02

[CBCS]

Full Marks : 32 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

[PROBLEM SOLVING TECHNIQUES IN PROBABILITY & STATISTICS]

Group - A

(4 Marks)

1. Answer any ***four*** questions : 1×4=4

(a) What is the probability to get two aces in succession from an ordinary deck of 52 cards without replacement?

(b) Write down the relationship between mean (μ), variance (σ^2) and 2nd moment about origin μ_2'.

(c) Let (x, y) and (u, v) represent two sets of bivariates datas such that $u = 2x + 3$ and $v = 3y + 7$. Then find the relation between r_{xy} and r_{uv}.

(d) If a person gets Rs. $(2x + 5)$, where x denotes the number of appearing, when a balanced die is rolled once, then how much money can be expected.

(e) A person goes from X to Y on cycle at 20 m.p.h and returns at 24 m.p.h. Find his average speed?

(f) A frequency distribution gives the following results; mean = 40, variance = 4, Karl Person's coefficient of skewness = 0·5. Find the mode of the distribution.

(g) Let X be a binomial $(4, p)$ variate and $P(X=2)=2=P(X=4)$. Find the value of p.

Group - B

(10 Marks)

Answer any ***two*** questions : 5×2=10

2. Let A and B be two independent witness in a case. The probability that A will speak the truth is x and the probability that B will speak the truth is y. A and B agree in a certain statement. Find the probability that this statement is true?

3. If there are two groups of data consisting of n_1 and n_2 observations with means $\bar{x}_1$ and $\bar{x}_2$, respectively, then prove that the composite mean for the combined data set of $(n_1 + n_2)$ observations is $\frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$.

4. Fit a straight line to the following data by the method of least squares :

x	15	20	25	30	35
y	12	14	18	25	31

5. Calculate the Median and Mode from the following data :

Value	*Frequency*
Less than 10	4
Less than 20	16
Less than 30	40
Less than 40	76
Less than 50	96
Less than 60	112
Less than 70	120
Less than 80	125

Group-C

(18 Marks)

Answer any ***two*** questions : 9×2=18

6. (a) A point is selected at random on a circle of unit radius. Compute the mathematical expectation of its distance from a fixed point of the circle. 4

(b) Find the mean, variance and the coefficient of Skewness and coefficient of Kurtosis, where the density function is given by $f(x) = kx^2e^{-x},\ 0 < x < \infty$. 5

7. (a) There are 500 students taking a Mathematics Honours cource in a Science College. The probability for any students to need a particular book from the college library on any day is 0.07. How many copies of the book should be kept in the library so that the probability may be greater than 0.95 that none of the students needing a copy from the library has to go back disappointed?

[Assuming normal distribution, given that $\frac{1}{\sqrt{2\pi}}\int_0^{1\cdot65} e^{-\frac{t^2}{2}}dt = 0\cdot4505$] 5

(b) The marks obtained by 9 students in statististics and Mathematics in an examination are as follows :

Students	1	2	3	4	5	6	7	8	9
Statistics (X)	70	72	80	45	60	35	50	94	55
Mathematics (Y)	60	83	72	63	74	54	40	85	58

Find the regression line of Y on X and X on Y. 4

8. (a) Find the measure of skewness from the following table giving the wages of 230 persons :

Wages (in Rs.)	*No. of persons*	*Wages (in Rs.)*	*No. of Persons*
140 - 160	12	220 - 240	50
160 - 180	18	240 - 260	45
180 - 200	35	260 - 280	20
200 - 220	42	280 - 300	8

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(b) Four roads lead away from a Jail. A prisoner escaping from the Jail and selects a road at random. If Road I is selected the probability of escaping is $\frac{1}{8}$, for road II it is $\frac{1}{6}$ for road III if is $\frac{1}{4}$ and if road IV is selected the probability of escaping is $\frac{9}{10}$. What is the probability that the prisoner will succeed in escaping? 4
