



S1 22(AIML) ISM EC2M Jan 2023

Introduction To Statistical Methods (Birla Institute of Technology and Science, Pilani)



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BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Work Integrated Learning Programmes Division

Cluster Programme - M. Tech(AIML)

I Semester , 2022 – 23(January,2023)

Mid semester Examination (**Makeup**)

Course No : AIMLCZC418
Course Title : Introduction to Statistical Methods
Nature of Exam. : Open Book (Online)
Weightage : 30 Marks
Duration : 120 minutes
Date : 28th January,2023_FN

Number of questions: 5
Number of Pages: 2

Q.1.a). Consider the following summary of a data. [4M]

Write important 4 observations from this summary which helps us to understand the data as a part of pre – processing.

	count	mean	std	min	25%	50%	75%	max
symboling	205.0	0.834146	1.245307	-2.00	0.00	1.00	2.00	3.00
wheel_base	205.0	98.756585	6.021776	86.60	94.50	97.00	102.40	120.90
length	205.0	174.049268	12.337289	141.10	166.30	173.20	183.10	208.10
width	205.0	65.907805	2.145204	60.30	64.10	65.50	66.90	72.30
height	205.0	53.724878	2.443522	47.80	52.00	54.10	55.50	59.80
curb_weight	205.0	2555.565854	520.680204	1488.00	2145.00	2414.00	2935.00	4066.00
engine_size	205.0	126.907317	41.642693	61.00	97.00	120.00	141.00	326.00
bore	205.0	3.329366	0.270858	2.54	3.15	3.31	3.58	3.94
stroke	205.0	3.256098	0.313634	2.07	3.11	3.29	3.41	4.17
compression_ratio	205.0	10.142537	3.972040	7.00	8.60	9.00	9.40	23.00
horsepower	205.0	104.165854	39.529733	48.00	70.00	95.00	116.00	288.00
peak_rpm	205.0	5126.097561	477.035772	4150.00	4800.00	5200.00	5500.00	6600.00
city_mpg	205.0	25.219512	6.542142	13.00	19.00	24.00	30.00	49.00
highway_mpg	205.0	30.751220	6.886443	16.00	25.00	30.00	34.00	54.00

b). Validate the following statement. Justify it. [3M]

“If two events are mutually exclusive, then they are independent also and vice versa”

Q.2.a). If $P(A) = 1/2$, $P(B) = 1/3$, $P(A/B) = 1/6$ find i). $P(B/A)$ ii). $P(B/A')$ iii). $P(A \cup B / A)$ iv). $P(B/A)$

v). $P(A \cap \bar{B})$ vi). $P(\bar{A} \cap \bar{B})$ vii). $P(\bar{A} \cap B)$ [4M]

b). Consider the following information related to road accidents.

Authorities identified that 15% of the road accidents are due to rash driving by self(A), 25%, 20%, 40% of road accidents are due to bad roads(B), road indiscipline by others(C) and various other reasons(D) respectively. Out of these accidents (A, B, C and D) 1%, 2%, 3% and

4% died after treatment. Find the percentage of deaths due to accidents.

[3M]

Q.3.a). A random variable X has the density function

[3M]

$$f(x) = \begin{cases} k e^{-0.5x}, & x \geq 0 \\ 0 & \text{elsewhere} \end{cases}$$

i). Determine k that renders f(x) as a valid density function.

ii). Find P (-1.5 < X < 2.5)

iii). Find P ([X] = 1), where [X] is the greatest integer less than or equal to X

b). Consider the following joint distribution of x and y.

[4M]

p(x,y)	x		
		1	2
y	1	0.15	0.15
	2	0.20	0.20
	3	0.05	0.10
	4	0.05	0.10

i) Validate the distribution

ii) Find Marginal distributions of x,y

iii) Find P(Y = 2/ X < 2)

iv) Are they independent random variables?

Q.4.a). If possible, find the probability distribution function of a binomial distribution with mean 4 and variance 4/3.

[3M]

b). The life of a certain kind of electronic device has a mean of 250 hours and a standard deviation of 20 hours. Assuming that the distribution of life times which are measured to the nearest hour can be approximated closely with a normal curve,

[3M]

(i) Find the probability that any one of these devices will have a lifetime of more than 200 hours.

(ii) What percentage will have life time from 250 to 300 hours.

Q.5. It is observed that waiting time of patients in a hospital is 15 minutes with a Standard deviation of 2 minutes. Sampling is used to validate this observation. Find the probability that the sampling mean lies between 12 to 17 minutes with sample size of 35.

[3M]

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