

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Work Integrated Learning Programmes Division

Cluster Programme - M. Tech in AI & ML

II Semester , 2022 – 23(July,2023)

Mid semester Examination (**MAKEUP**)

Course No : AIMLC ZC418

Course Title : Introduction to Statistical Methods

Nature of Exam. : Open Book(Online)

Weightage : 30 Marks

Duration : 120 minutes

Date : 29th July,2023_FN

Number of questions:4

Number of Pages: 2

Q. No	Question	Marks																																																																																																																																							
Q.1.a)	<p>In a college 45% students registered for Machine Learning (ML) course, 60% registered for Introduction to Statistical Methods(ISM) course and 50% registered for Deep Learning (DL) course. 15% registered for ML & ISM,25% registered for ISM & DL, 20% registered for ISM & DL. 5% registered for all the three courses.Validate this data.If valid, then find the following</p> <p>i).Percentage of students registered for ML course only.</p> <p>ii).Percentage of students registered for ML but not DL.</p> <p>iii). Percentage of students registered for ML and ISM but not DL.</p> <p>iv).Percentage of students registered for ML and DL but not ISM.</p>	4M																																																																																																																																							
Q.1.b)	<p>Following is the statistical summary of a data set.</p> <p>Write any 3 useful observations from this summary which helps you in Proceeding further with ML modelling.</p> <table><thead><tr><th></th><th>count</th><th>mean</th><th>std</th><th>min</th><th>25%</th><th>50%</th><th>75%</th><th>max</th></tr></thead><tbody><tr><td>symboling</td><td>205.0</td><td>0.834146</td><td>1.245307</td><td>-2.00</td><td>0.00</td><td>1.00</td><td>2.00</td><td>3.00</td></tr><tr><td>wheel_base</td><td>205.0</td><td>98.756585</td><td>6.021776</td><td>86.60</td><td>94.50</td><td>97.00</td><td>102.40</td><td>120.90</td></tr><tr><td>length</td><td>205.0</td><td>174.049268</td><td>12.337289</td><td>141.10</td><td>166.30</td><td>173.20</td><td>183.10</td><td>208.10</td></tr><tr><td>width</td><td>205.0</td><td>65.907805</td><td>2.145204</td><td>60.30</td><td>64.10</td><td>65.50</td><td>66.90</td><td>72.30</td></tr><tr><td>height</td><td>205.0</td><td>53.724878</td><td>2.443522</td><td>47.80</td><td>52.00</td><td>54.10</td><td>55.50</td><td>59.80</td></tr><tr><td>curb_weight</td><td>205.0</td><td>2555.565854</td><td>520.680204</td><td>1488.00</td><td>2145.00</td><td>2414.00</td><td>2935.00</td><td>4066.00</td></tr><tr><td>engine_size</td><td>205.0</td><td>126.907317</td><td>41.642693</td><td>61.00</td><td>97.00</td><td>120.00</td><td>141.00</td><td>326.00</td></tr><tr><td>bore</td><td>205.0</td><td>3.329366</td><td>0.270858</td><td>2.54</td><td>3.15</td><td>3.31</td><td>3.58</td><td>3.94</td></tr><tr><td>stroke</td><td>205.0</td><td>3.256098</td><td>0.313634</td><td>2.07</td><td>3.11</td><td>3.29</td><td>3.41</td><td>4.17</td></tr><tr><td>compression_ratio</td><td>205.0</td><td>10.142537</td><td>3.972040</td><td>7.00</td><td>8.60</td><td>9.00</td><td>9.40</td><td>23.00</td></tr><tr><td>horsepower</td><td>205.0</td><td>104.165854</td><td>39.529733</td><td>48.00</td><td>70.00</td><td>95.00</td><td>116.00</td><td>288.00</td></tr><tr><td>peak_rpm</td><td>205.0</td><td>5126.097561</td><td>477.035772</td><td>4150.00</td><td>4800.00</td><td>5200.00</td><td>5500.00</td><td>6600.00</td></tr><tr><td>city_mpg</td><td>205.0</td><td>25.219512</td><td>6.542142</td><td>13.00</td><td>19.00</td><td>24.00</td><td>30.00</td><td>49.00</td></tr><tr><td>highway_mpg</td><td>205.0</td><td>30.751220</td><td>6.886443</td><td>16.00</td><td>25.00</td><td>30.00</td><td>34.00</td><td>54.00</td></tr></tbody></table>		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	3M
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Q.2.a)	<p>If two events, A and B, are such that $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cap B) = 0.20$, find the Following.i) $P(A A \cup B)$ ii) $P(A A \cap B)$ iii) $P(A^c A \cup B)$</p>	4M																																																																																																																																							

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Q.2.b)	<p>Probabilities of Mr.Steves and Mr. John graduating from a University are 0.6 and 0.4 respectively. Probabilities of they getting placement offer after graduation are 0.15 and 0.25 respectively. Find the following</p> <p>i) Probability that Mr Steves was not graduated given that he got the placement offer.</p> <p>ii) Probability that Mr John was not graduated given that he got the placement offer.</p> <p>iii) Probability that both got placement offer but not graduated.</p>	3M
Q.3.a)	<p>Consider the following function:</p> $f(x,y) = \frac{x + ky}{2}, 0 < x < 1 \text{ and } 0 < y < 2$ <p>i).Is there any possibility of considering f(x) as probability density function? Discuss.</p> <p>ii).If possible find mean and variance of the distribution.</p>	4 M
Q.3.b)	<p>Consider the probabilities of two random variables X and Y, which are independent. $P(x = 0) = 0.20$, $P(x = 1) = 0.50$, $P(x = 2) = 0.30$, $P(y = -1) = 0.25$, $P(y = 0) = 0.35$, $P(y = 1) = 0.40$.</p> <p>i).Find the joint the probability distribution of (X, Y).</p> <p>ii).$P(x < 2 / y = -1)$.</p> <p>iii).$P(x < 1/ y < 1)$.</p>	4 M
Q.4.a)	<p>It is assumed that average marks of students in a course is 65 with standard deviation 5.Sampling is done by considering samples of size 45.Then find</p> <p>i).the probability that mean of the sampling distribution lies between 55 and 70.</p> <p>ii).the probability that mean of the sampling distribution is 70.</p>	4 M
Q.4.b)	<p>Consider that the time taken for processing a product(X)follows normal distribution with mean 20 minutes with variance 4.Then find the following</p> <p>i).$P(X > 25)$</p> <p>ii)$P(15 < X < 28)$</p> <p>iii)$P(X = 22)$</p>	4 M

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