

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Work Integrated Learning Programmes Division

Cluster Programme - M. Tech in AI & ML

II Semester , 2023 – 24(July,2024)

Mid semester Examination (**Regular**)

Course No : AIMLC ZC418
 Course Title : Introduction to Statistical Methods
 Nature of Exam. : Open Book (Online)
 Weightage : 30 Marks
 Duration : 120 minutes
 Date : 20th July,2024_10 AM

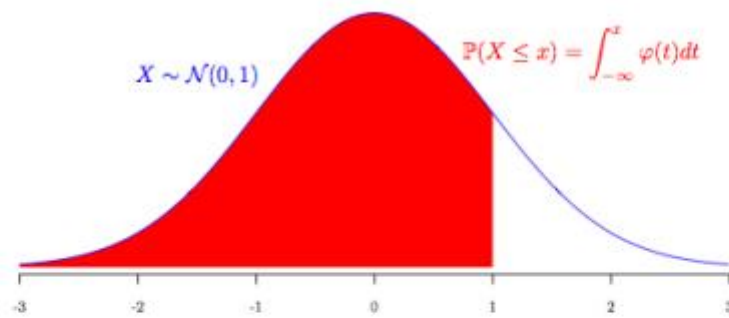
Number of questions:8

Number of Pages: 2

Q. No	Question	Marks																																													
Q.1.	<div>Following is the statistical summary of some data set</div> <table><tr><td></td><td>HHV</td><td>WBN</td><td>BNC</td><td>HBCN</td></tr><tr><td>Count</td><td>908</td><td>900</td><td>867</td><td>908</td></tr><tr><td>Mean</td><td>150</td><td>65</td><td>150</td><td>68</td></tr><tr><td>S.D</td><td>10</td><td>5</td><td>8</td><td>4</td></tr><tr><td>25%</td><td>90</td><td>25</td><td>90</td><td>30</td></tr><tr><td>50%</td><td>120</td><td>65</td><td>125</td><td>60</td></tr><tr><td>75%</td><td>130</td><td>70</td><td>135</td><td>63</td></tr><tr><td>Minimum</td><td>30</td><td>15</td><td>75</td><td>30</td></tr><tr><td>Maximum</td><td>160</td><td>75</td><td>180</td><td>90</td></tr></table> <div>Write at least three inferences based on the above summary which helps in understanding the data</div>		HHV	WBN	BNC	HBCN	Count	908	900	867	908	Mean	150	65	150	68	S.D	10	5	8	4	25%	90	25	90	30	50%	120	65	125	60	75%	130	70	135	63	Minimum	30	15	75	30	Maximum	160	75	180	90	3M
	HHV	WBN	BNC	HBCN																																											
Count	908	900	867	908																																											
Mean	150	65	150	68																																											
S.D	10	5	8	4																																											
25%	90	25	90	30																																											
50%	120	65	125	60																																											
75%	130	70	135	63																																											
Minimum	30	15	75	30																																											
Maximum	160	75	180	90																																											
Q.2	<div>Let A and B are two independent events with probabilities 0.35 and 0.30 respectively. Then validate the following statements and justify</div> <div>a) $P(A \cup B) = 0$ as they are independent</div> <div>b) $P(A \cap B) = 0$ as they are mutually exclusive</div> <div>c) Find $P(A^c \cap B^c)$ (where A^c indicates the compliment of event A)</div>	4M																																													
Q.3	<div>Consider the following probabilities of three events A,B and C: $P(A) = 0.50, P(B) = 0.55, P(C) = 0.45, P(A \cap B) = 0.20, P(B \cap C) = 0.20,$ $P(A \cap C) = 0.15$ and $P(A \cap B \cap C) = 0.05$</div> <div>Find the following</div> <div>a) $P(A A \cup B)$</div> <div>b) $P(B A \cap B)$</div> <div>c) $P(A \cap B A \cup B)$</div> <div>d) $P(A \cup B A \cap B \cap C)$</div>	4M																																													
Q.4	<div>Hardik Pandya, Rishabh Pant and Surya Kumar Yadav are in the race of leading Indian cricket team in the next world cup with probabilities 0.2, 0.5 and 0.3 respectively. The probabilities of getting an increase in the match fee by Hardik, Rishabh and Surya are 0.3, 0.6 and 0.5 respectively if they become the Captain.</div> <div>If there is an increase in match fee then find the probability</div> <div>a) that it is because of Hardhik</div>	4M																																													

	<div>b) that it is because of Rishabh c) that it is because of Surya Kumar</div>																					
Q.5	<div>Let $f(x)$ be a continuous random variable defined in $[0,2]$ as $f(x) = k(x + 1)/4$, then find a) k value b) mean of x c) Expectation of x^2 d) Variance e) $P(0.5 < x < 1.5)$</div>	4M																				
Q.6	<div>Let X and Y are two independent random variables with the probability distributions given as</div> <table><tr><td>X</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>$P(X)$</td><td>0.25</td><td>0.15</td><td>0.35</td><td>0.25</td></tr></table> <div></div> <table><tr><td>Y</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>$P(Y)$</td><td>0.10</td><td>0.20</td><td>0.30</td><td>0.40</td></tr></table> <div>Then find the following a) If possible find the joint distribution of X and Y. If not, justify it. b) If possible, find $P(x < 1, Y < 2)$ c) If possible, find $P(X < 1 / Y < 2)$</div>	X	-1	0	1	2	$P(X)$	0.25	0.15	0.35	0.25	Y	0	1	2	3	$P(Y)$	0.10	0.20	0.30	0.40	4M
X	-1	0	1	2																		
$P(X)$	0.25	0.15	0.35	0.25																		
Y	0	1	2	3																		
$P(Y)$	0.10	0.20	0.30	0.40																		
Q.7	<div>Let X be a random variable which follows binomial distribution with $n = 150$ and $p = 0.2$ then find $P(50 < X < 80)$</div>	4M																				
Q.8	<div>It is observed that average amount of time that a customer spends in a super market is 40 minutes with a standard deviation of 5 minutes. Then find the probability of sampling distribution of mean time lies between 35 and 45 minutes where the sample size is 50.</div>	3M																				

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-0	.50000	.49601	.49202	.48803	.48405	.48006	.47608	.47210	.46812	.46414
-0.1	.46017	.45620	.45224	.44828	.44433	.44034	.43640	.43251	.42858	.42465
-0.2	.42074	.41683	.41294	.40905	.40517	.40129	.39743	.39358	.38974	.38591
-0.3	.38209	.37828	.37448	.37070	.36693	.36317	.35942	.35569	.35197	.34827
-0.4	.34458	.34090	.33724	.33360	.32997	.32636	.32276	.31918	.31561	.31207
-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
-0.6	.27425	.27093	.26763	.26435	.26109	.25785	.25463	.25143	.24825	.24510
-0.7	.24196	.23885	.23576	.23270	.22965	.22663	.22363	.22065	.21770	.21476
-0.8	.21186	.20897	.20611	.20327	.20045	.19766	.19489	.19215	.18943	.18673
-0.9	.18406	.18141	.17879	.17619	.17361	.17106	.16853	.16602	.16354	.16109
-1	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08692	.08534	.08379	.08226
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-2	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
-2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
-2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
-2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
-2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
-2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
-2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
-2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
-2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
-2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
-3	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
-3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
-3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
-3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
-3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-4	.00003	.00003	.00003	.00003	.00003	.00003	.00002	.00002	.00002	.00002



	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990