

# 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 (**Regular**)

Course No : AIMLC ZC418

Course Title : Introduction to Statistical Methods

Nature of Exam. : Open Book(Online)

Weightage : 30 Marks

Duration : 120 minutes

Date : 16<sup>th</sup> July,2023\_FN

*Number of questions:4*

*Number of Pages: 2*

Q. No	Question	Marks																					
SET A																							
Q.1.a)	Let A be an event of a student passing the examination and B be the event of getting preplacement offer(PPO) with probabilities $\frac{3}{4}$ and $\frac{1}{8}$ respectively in a university. Then find the probability that a student i).passing the examination and also getting PPO ii).failing in the examination but getting PPO iii).neither passing the examination nor getting PPO	4 M																					
Q.1.b)	Consider the following data and answer the questions if possible. Otherwise state reasons. <table><tr><td>Marks (X)</td><td>25</td><td>35</td><td>45</td><td>55</td><td>65</td><td>75</td></tr><tr><td>Number of Students</td><td>10</td><td>20</td><td>25</td><td>35</td><td>5</td><td>5</td></tr><tr><td>Grade</td><td>E</td><td>D</td><td>C</td><td>B</td><td>A</td><td>A+</td></tr></table> i).Find $P(X > 55)$ ii).Find $P(X < 35)$ iii).Find $P(35 < X < 65)$	Marks (X)	25	35	45	55	65	75	Number of Students	10	20	25	35	5	5	Grade	E	D	C	B	A	A+	3 M
Marks (X)	25	35	45	55	65	75																	
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Q.1.a)	Let A be an event of a student passing the examination and B be the event of getting preplacement offer(PPO) with probabilities $\frac{1}{8}$ and $\frac{3}{4}$ respectively in a university. Then find the probability that a student i).passing the examination or getting PPO ii).passing the examination but not getting PPO iii).neither passing the examination nor getting PPO	4 M																					
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SET A																							

Q.2.a)	If two events, A and B, are such that $P(A) = 0.3$ , $P(B) = 0.5$ , and $P(A \cap B) = 0.15$ , find the Following:i) $P(A A \cup B)$ ii) $P(A A \cap B)$ iii) $P(A \cap B A \cup B)$	<b>4 M</b>																									
Q.2.b)	An e – commerce company has three delivery boys A, B and C who delivers 30%, 40% and 30% of items daily from the warehouse. It is observed that they take more time than the expected with probabilities 5%, 10% and 3% respectively. a).Find that the probability that the delivery is always delayed by the company. b).The probability that the delay in delivery is by A	<b>3 M</b>																									
SET B																											
Q.2.a)	If two events, A and B, are such that $P(A) = 0.3$ , $P(B) = 0.5$ , and $P(A \cap B) = 0.10$ , find the Following:i) $P(A A \cup B)$ ii) $P(A A \cap B)$ iii) $P(A \cap B A \cup B)$	<b>4 M</b>																									
Q.2.b)	An e – commerce company has three delivery boys A, B and C who delivers 30%, 40% and 25% of items daily from the warehouse. It is observed that they take more time than the expected with probabilities 5%, 10% and 3% respectively. i).Find that the probability that the delivery is always delayed by the company ii).The probability that the delay in delivery is by B	<b>3 M</b>																									
SET A																											
Q.3.a)	Probability distribution of two random variables X and Y are given below. <table border="1"><tr><td>Y</td><td colspan="4">X</td></tr><tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>0</td><td>0.15</td><td>0.30</td><td>0.05</td><td>0</td></tr><tr><td>1</td><td>0.05</td><td>0.15</td><td>2k</td><td>0.05</td></tr><tr><td>2</td><td>0</td><td>0.05</td><td>0.10</td><td>k</td></tr></table> i).If possible find the value of k. ii).Find marginal distribution of X iii).Find marginal distribution of Y	Y	X					0	1	2	3	0	0.15	0.30	0.05	0	1	0.05	0.15	2k	0.05	2	0	0.05	0.10	k	<b>4 M</b>
Y	X																										
	0	1	2	3																							
0	0.15	0.30	0.05	0																							
1	0.05	0.15	2k	0.05																							
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Q.3.b)	Consider the following probability distribution. <table border="1"><tr><td>X</td><td>-2</td><td>-1</td><td>1</td><td>2</td></tr><tr><td>P(X)</td><td>0.20</td><td>0.40</td><td>0.25</td><td>0.15</td></tr></table> i).”Probability distribution is not valid because x is negative”. Validate. ii).If the distribution is valid then find mean and variance. iii). $P(X > -1)$	X	-2	-1	1	2	P(X)	0.20	0.40	0.25	0.15	<b>4 M</b>															
X	-2	-1	1	2																							
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Y	X																										
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2	0	0.05	0.10	k																							
	i).Find the probability $P(Y > X)$ . ii).Validate the statement" X and Y are independent"																										
Q.3.b)	Consider the following probability distribution. <table><tr><td>X</td><td>-2</td><td>-1</td><td>1</td><td>2</td></tr><tr><td>P(X)</td><td>0.20</td><td>0.40</td><td>0.25</td><td>0.15</td></tr></table> i). "Probability distribution is not valid because x is negative". Validate. ii).If the distribution is valid then find $E(X)$ , $E(X^2)$ and hence variance of X.	X	-2	-1	1	2	P(X)	0.20	0.40	0.25	0.15	4 M															
X	-2	-1	1	2																							
P(X)	0.20	0.40	0.25	0.15																							
SET A																											
Q.4.a)	Let X be a random variable which follows binomial distribution with n = 500 and p = 0.25. Then find the following i). $P(X > 290)$ ii) $P(X = 250)$ iii). $P(120 < X < 180)$ .	4 M																									
Q.4.b)	The rain fall (in cms) in a Country during every July month is normally distributed with mean and standard deviation of rainfall are respectively as 12cms and 1.25cms. For the July month of 2022, calculate the probabilities of having rainfall i) more than 15 cms ii).in between 13cms and 18cms. iii) of 12 cms	4 M																									
SET B																											
Q.4.a)	Let X be a random variable which follows binomial distribution with n = 500 and p = 0.20. Then find the following i). $P(X > 290)$ ii) $P(X = 250)$ iii). $P(120 < X < 180)$ .	4 M																									
Q.4.b)	The rain fall (in cms) in a Country during every July month is normally distributed with mean and standard deviation of rainfall are respectively as 12cms and 1.25cms. For the July month of 2022, calculate the probabilities of having rainfall i) less than 15 cms ii).in between 13cms and 18cms. iii) of 13 cms	4 M																									