Sanjay Ghodawat University, Kolhapur
Established as State Private University under Govt. of Maharashtra.
Act No XL, 2017

2019-20
EXM/P/09/00

Year and Program:2019-20	**School of Science**	**Department of Mathematics**
B.Sc. III	Section-A.	
Course Code – MTS307.1	**Course Title – Probability and Statistics**	**Semester – V**
Day and Date - Thursday 28/11/19	**End Semester Examination**	**Time:** ½ hr 10:30am to 11am
		Max Marks: 100
PRN number –	**Seat no-**	**Answer Booklet No.-**
Students' Signature -		**Invigilator's Signature –**

Instructions:

1) All questions are compulsory.
2) **Attempt Q.1 within first 30 minutes.**
3) Each MCQ type question is followed by four plausible alternatives, Tick (√) the correct one.
4) Answer to question 1 should be written in the question paper and submit to the Jr. Supervisor.
5) If you tick more than one option it will not be evaluated.
6) Figures to the right indicate full marks.
7) Use **Blue ball pen** only.

Q.1	Tick mark (√) the correct alternative	Marks	Bloom's Level	CO's
i)	Way of getting information from measuring observation whose outcomes occurrence is on chance is called a) beta experiment, b) random experiment, c) alpha experiment, d) gamma experiment.	02	L_1	CO1
ii)	Probability of second event, in a situation if first event has been occurred, is classified as a) series probability, b) joint probability, c) conditional probability, d) dependent probability.	02	L_1	CO1
iii)	If positive square root is taken of population variance then calculated measure is transformed into a) standard root, b) sample variance, c) standard variance, d) standard deviation.	02	L_1	CO1

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iv)	Variables, whose measurements are done in terms of weight, height and length, are classified as. a) continuous variables, b) measuring variables, c) flowchart variables, d) discrete variables.	02	L_1	CO2
v)	In probability theory, events which can never occur together are classified as a) collectively exclusive events, b) mutually exhaustive events, c) mutually exclusive events, d) collectively exhaustive events.	02	L_1	CO2
vi)	In random experiment, observations of random variable are classified as a) trials, b) events, c) composition, d) functions.	02	L_1	CO2
vii)	According to percentiles, median measured must lie in a) 80^{th}, b) 40^{th}, c) 50^{th}, d) 100^{th}.	02	L_1	CO3
viii)	The sum of probabilities of a discrete random variable is always a) one, b) two, c) four, d) three.	02	L_1	CO3
ix)	A continuous probability can be represented by a) constant, b) graph, c) table, d) none.	02	L_1	CO3
x)	A Random Variable which assumes an infinite number of values is called a) discrete random variable, b) absolute Variable, c) continuous random variable, d) none of these.	02	L_1	CO3

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Year and Program: 2019-20
B.Sc. III
Course Code: MTS3071

School of Science
Section-B.
Course Title: – Probability and Statistics

Department of Mathematics
Semester – V

Day and Date: Thursday 28/11/19

End Semester Examination (ESE)

Time: 2.5hr 11am to 1.30pm
Max Marks: 100

Instructions:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Non-programmable calculator is allowed

Q.No.			Marks	Bloom's Level	CO
Q.2		**Solve any TWO of the following.**			
	i)	Calculate the mean and standard deviation for the following data.	08	L_4	CO1

Age in years	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

			Marks	Bloom's Level	CO
	ii)	Calculate the mean, median and mode for the following data,	08	L_4	CO1

Lengths (mm)	150-154	155-159	160-164	165-169	170-174	175-179	180-184	185-189
Freq.	5	2	6	8	9	11	6	3

			Marks	Bloom's Level	CO
	iii)	Calculate the co-efficient of correlation for the following data,	08	L_4	CO1

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

			Marks	Bloom's Level	CO
Q.3		**Solve any FOUR of the following.**			
	i)	For any positive integer n and $r = 1,2,3,4\ldots,n$ prove that $\binom{n}{r} = \binom{n-1}{r} + \binom{n-1}{r-1}$.	04	L_2	CO2
	ii)	Show that $\sum_{r=0}^{n} \binom{n}{r}^2 = \binom{2n}{n}$.	04	L_2	CO2
	iii)	If ϕ is a empty set, then prove that $P(\phi) = 0$.	04	L_2	CO2
	iv)	If a fair coin is tossed twice, what is the probability of getting at least one head?	04	L_2	CO2
	v)	Let $\{A_1, A_2, A_3, \ldots, A_n\}$ be a finite collection of n events such that $A_i \cap A_j = \phi$ for $i \neq j$ then prove that $P\left(\bigcup_{i=1}^{n} A_i\right) = \sum_{i=1}^{n} P(A_i)$.	04	L_2	CO2

Q.4	a)	**Solve any ONE of the following .**			
	i)	Calculate Arithmetic mean, Geometric mean, Harmonic mean for the following data 85, 96, 76, 108, 85, 80, 100, 85, 70, 95.	08	L_3	CO1
	ii)	Calculate mean deviation about median for the following data.	08	L_3	CO1

Class	0-10	10-20	20-30	30-40	40-50	50-60
Freq.	6	7	15	16	4	2

	b)	**Solve any TWO of the following.**			
	i)	If A and B are any two events then show that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.	04	L_2	CO2
	ii)	If A_1 and A_2 are two events such that $A_1 \subseteq A_2$ then prove that $P(A_2 \setminus A_1) = P(A_2) - P(A_1)$.	04	L_2	CO2
	iii)	Let A and B be events in a sample space S such that $P(A) = P(B) = \frac{1}{2}$ and $P(A^c \cap B^c) = \frac{1}{3}$. Find $P(A \cup B^c)$.	04	L_2	CO2
Q.5		**Solve any FOUR of the following.**			
	i)	Find the cumulative distribution function of $f(t) = \frac{1}{\pi\left[1 + (t - \theta)^2\right]}$ with parameter θ.	04	L_3	CO3
	ii)	Find the probability density function of the random variable whose cdf is $F(x) = \frac{1}{1 + e^{-x}}$; $-\infty < x < \infty$.	04	L_3	CO3
	iii)	If the random variable X has the density function $f(x) = \begin{cases} e^{x-2} & ;\text{for } x < 2 \\ 0 & ;\text{otherwise} \end{cases}$ then find the 75th percentile of X.	04	L_3	CO3
	iv)	Find the 87.5 percentile for the distribution with density function $f(x) = \frac{1}{2} e^{-\lvert x \rvert}$; $-\infty < x < \infty$.	04	L_3	CO3
	v)	For what value of the constant c, the real valued function $f : R \to R$ given by $f(x) = \begin{cases} c & ;\text{if } a \le x \le b, \\ 0 & ;\text{otherwise,} \end{cases}$ where a, b are real constants, is a probability density function for the random variable X?	04	L_3	CO3

Q.6 **Solve any FOUR of the following.**

		Marks	Bloom's Level	CO
i)	For what value of the constant c, the real valued function $f: R \to R$ given by $f(x) = \frac{c}{1+(x-\theta)^2}$ $-\infty < x < \infty$, where θ is parameter, is a probability density function for the random variable X? Justify your claim.	04	L_2	CO3
ii)	Is there the real valued function $f: R \to R$ defined by $f(x) = \begin{cases} 1+\lvert x\rvert & ;\text{if } -1 < x < b \\ 0 & ;\text{otherwise} \end{cases}$, a probability density function for some random variable X? Justify your claim.	04	L_2	CO3
iii)	Is there the real valued function $f: R \to R$ defined by $f(x) = \begin{cases} 2x^{-2} & ;\text{if } 1 < x < 2 \\ 0 & ;\text{otherwise} \end{cases}$, a probability density function for some random variable X? Justify your claim.	04	L_2	CO3
iv)	If probability density function of the random variable X is given by $f(x) = \frac{(2x-1)}{144}$;for $x = 1,2,3,\ldots,12$ then find the cumulative distribution function of X.	04	L_2	CO3
v)	If the probability of random variable X with space $R_X = \{1,2,3,\ldots,12\}$ is given by $f(x) = k(2x-1)$, then find is the value of constant k?	04	L_2	CO3

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