Sanjay Ghodawat University, Kolhapur

2019-20

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

EXM/P/09/01

Year and Program:2019-20 B.Sc.II	**School of Science**	**Department of Mathematics**
Course Code: MTS 201	**Course Title: Mathematics III**	**Semester – III**
Day and Date: Monday 25-11-2019	**End Semester Examination (ESE)**	**Time:** Hrs. 10.30 to 11.00 pm.
		Max Marks: 100
PRN/Exam seat No:		**Answer booklet No:**
Student's signature:		**Invigilator 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		**Choose the correct alternative for following questions.**	Marks	Bloom's Level	CO
	i)	Consider the following two statements. I) $A\setminus(B\cup C)=(A\setminus B)\cup(A\setminus C)$ II) $A\setminus(B\cap C)=(A\setminus B)\cap(A\setminus C)$, where A,B,C are sets, then a) only I is true, b)only II is true, c) both I and II are true, d) both I and II are false.	02	L_1	CO1
	ii)	The set A of all real numbers x such that $2x+3\le 6$ then a) $A=\left\{x\in R: x\le 3/2\right\}$, b) $A=\left\{x\in R: x< 3/2\right\}$, c) $A=\left\{x\in R: x> 3/2\right\}$, d) $A=\left\{x\in R: x\ge 3/2\right\}$.	02	L_2	CO2
	iii)	Consider the following two statements. I) Every bounded sequence in R contains convergent subsequence. II) A sequence $\{P_n\}$ Converges to p, if every subsequence of $\{P_n\}$ converges to p. Then a) both I and II are true b) only I is true, c) both I and II are false, d) only II is true.	02	L_1	CO3

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iv)	Consider the following two statements. I) If $\sum a_n$ converges then $\lim_{n\to\infty} a_n = 0$. II) If $\lim_{n\to\infty} a_n = 0$ then $\sum a_n$ converges. Then a) both I and II are true, b) only I is true, c) both I and II are false, d) only II is true.	02	L_1	CO4
v)	Consider the following two statements. I) $\sum \frac{1}{\sqrt[3]{n}}$, II) $\sum \frac{1}{n^3+n}$. a) both I and II are convergent, b)only I is convergent, c) both I and II are not convergent, d) only II is convergent.	02	L_2	CO4
vi)	Which one of the following Series is divergent a) $\sum \frac{1}{(2n-1)(2n)}$, b) $\sum \frac{2^n}{n}$, c) $\sum \frac{n^2}{n!}$, d) $\sum \frac{1}{\sqrt[3]{n^5}}$.	02	L_1	CO4
vii)	If $S_n = 1 + \left[\frac{(-1)^n}{n}\right]$ then the sequence $\{S_n\}$ is a) converges to 1 and bounded, b) converges to 0 and bounded, c) converges to 1 and unbounded, d) converges to 0 and unbounded.	02	L_1	CO5
viii)	$\lim_{n\to\infty} \frac{x^2+nx}{n} \quad \forall x \in R$ a) 1, b) 0, c) -1, d) x.	02	L_1	CO5
ix)	$\lim_{n\to\infty} \frac{nx}{1+n^2x^2}$ *for all* $x \in R$ a) 1, b) 0, c) -1, d) e.	02	L_1	CO5
x)	$\lim_{n\to\infty} \frac{3x^2+7}{n} \quad \forall x \in R$ a) 1, b)0, c)-1, d) not exist.	02	L_1	CO5

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Year and Program:2018-19	**School of Science**	**Department of Mathematics**
B.Sc.II		
Course Code: MTS 201	**Course Title: Mathematics III**	**Semester – III**
Day and Date: Monday 25-11-2019	**End Semester Examination (ESE)**	**Time:** 2.5 Hrs. 11.00 to 1.30 pm
		Max Marks: 100

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

			Marks	Bloom's Level	CO
Q.2		**Solve any Two of the following.**			
	a)	Prove that every subset of countable set is countable.	06	L_2	CO1
	b)	Prove that any open interval (a,b) is equivalent to any other open interval (c,d).	06	L_2	CO1
	c)	Show that for each $n \in N$, the sum of the first n natural numbers is given by $\frac{1}{2}n(n+1)$.	06	L_2	CO1
Q3		**Solve any Two of the following.**			
	a)	If x and y are any real numbers with property $x<y$, then prove that there exist a rational number $r \in Q$ such that $x<r<y$.	07	L_3	CO2
	b)	If $x>-1$ then prove that $(1+x)^n \geq 1+nx$.	07	L_3	CO2
	c)	Determine the set A of $x \in R$ such that $\lvert 2x+3 \rvert < 7$.	07	L_3	CO2
Q4		**Solve any Two of the following.**			
	a)	Let $X=(x_n)$ be a sequence of real numbers that converges to x and suppose that $x_n>0$. Then show that the sequence $\sqrt{x_n}$ of positive square roots converges and $\lim\limits_{n\to\infty}\left(\sqrt{x_n}\right)=\sqrt{x}$.	07	L_2	CO3
	b)	Let $X=(x_n)$ be a bounded sequence of real numbers where $x \in R$, have the property that every convergent subsequence of X converges to x. Then prove that the sequence X converges to x.	07	L_2	CO3

	c)	Show that, a monotone sequence of real numbers is convergent if and only if it is bounded. Further if $X=(x_n)$ is bounded increasing sequence, then $\lim_{n\to\infty}(x_n)=\sup\{x_n : n\in N\}$.	07	L_2	CO3
Q5	a)	**Solve any Three of the following.**			
	i)	If a series $\sum x_n$ is convergent, then show that any series obtained from it by grouping the terms is also convergent and to the same value.	05	L_3	CO4
	ii)	Show that the series $\sum_{n=1}^{\infty}\frac{1}{n^2+n}$ is convergent.	05	L_3	CO4
	iii)	Establish the convergence or the divergence of the series whose n[th] term is $\frac{n}{(n+1)(n+2)}$.	05	L_3	CO4
	iv)	Establish the convergence or the divergence of the series $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n}$.	05	L_3	CO4
	b)	Establish the convergence or the divergence of the series $\sum_{n=1}^{\infty}\frac{1}{n^2-n+1}$.	05	L_3	CO4
Q.6	a)	Let (f_n) be a sequence of functions in $\Re[a,b]$ and suppose that (f_n) converges uniformly on $[a,b]$ to f. Then prove that $f\in\Re[a,b]$ and $\int_a^b f=\lim_{n\to\infty}\int_a^b f_n$.	08	L_4	CO5
	b)	**Solve any Two of the following.**			
	i)	A sequence (f_n) of bounded functions on $A\subseteq R$ converges uniformly on A to f if and only if $\lVert f_n-f\rVert_A\to 0$.	06	L_4	CO5
	ii)	Show that $\lim_{n\to\infty}\left(\frac{1}{n}\sin(nx+n)\right)=0$ for $x\in R$.	06	L_4	CO5
	iii)	Let (f_n) be a sequence of continuous functions on a set $A\subseteq R$ and suppose that (f_n) converges uniformly on A to a function $f: A\to R$. Then show that f is continuous on A.	06	L_4	CO5

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