QP CODE: D4BAM2403	(Pages: 2)	Reg. No	:	....
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FOURTH SEMESTER FYUGP EXAMINATION, APRIL 2026

Discipline Specific Core (DSC) Courses - Major

AMA4CJ205 : REAL ANALYSIS

(Credits: 4)

Time: 2 Hours	Maximum Marks: 70

Section A

Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1.	State the principle of Mathematical Induction (second version).	BL1	CO1
2.	If $a \in \mathbb{R}$ such that $0 \leq a < \varepsilon$ for every $\varepsilon > 0$, then prove that $a = 0$	BL2	CO1
3.	Determine the set $B = \{\, x \in \mathbb{R} : \lvert x-1\rvert < \lvert x\rvert\}$.	BL2	CO1
4.	Find the infimum and supremum of $A = \{x \in \mathbb{R} : x + 2 \geq x^2\}$, if it exist.	BL3	CO2
5.	Check whether the following statement is true or false and justify your answer: "Every nested sequence of intervals has a common point."	BL3	CO2
6.	Write the first five terms of the sequence (x_n) defined by $x_n = \dfrac{1}{n^2+2}$.	BL3	CO2
7.	a) Define a monotone sequence of real numbers. b) State the the Monotone Convergence Theorem.	BL1	CO3
8.	a) Define subsequence of a real sequence. b) Write any one subsequence of $(x_n) = \left(\dfrac{1}{n}\right)$.	BL2	CO3
9.	a) State divergence criteria. b) Give an example of an unbounded sequence that has a convergent subsequence.	BL2	CO3
10.	Show that every polynomial function is continous on $\mathbb{R}$.	BL2	CO4

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11.	(a) Prove that if $a, b \in \mathbb{R}$ and $a + b = 0$, then $b = -a$, (b) Prove that $-(-a) = a$ for any $a \in \mathbb{R}$	BL3	CO1

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12.	Prove that the set of rational numbers is denumerable.	BL2	CO1
13.	State and prove Density theorem	BL2	CO2
14.	Use the definition of limit of a sequence to establish $lim\left(\dfrac{3n+2}{n+1}\right) = 3.$	BL3	CO2
15.	Prove that the sequence $((-1)^n)$ is divergent.	BL2	CO2, CO3
16.	a) Prove that a convergent sequence of real numbers is bounded. b) Give an example of a bounded sequence which is not convergent.	BL1	CO3
17.	a) Define limit of a function at a point. b) Use definition of limit to find $\lim\limits_{x\to c} \dfrac{1}{x}$.	BL2	CO4
18.	a) Define Dirichlet's function on $\mathbb{R}$. b) Show that the Dirichlet's function is not continuous at any point of $\mathbb{R}$.	BL2	CO4
	Section C		
	Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19.	a) State Monotone Convergence Theorem. b) Let $Y = (y_n)$ be defined by $y_1 = 1$ and $y_{n+1} = \dfrac{1}{4}(2y_n + 3)$ for $n \in \mathbb{N}$. Show that $\lim \mathrm{Y} = \dfrac{3}{2}$	BL3	CO3
20.	a) Prove that Cauchy sequence of real numbers is bounded. b) Let $X = (x_n)$ be defined by $x_1 = 1$ and $x_2 = 2$ and $x_n = \dfrac{1}{2}(x_{n-1} + x_{n-2})$ for $n > 2$. Find $lim(X)$	BL2	CO4
	CO : Course Outcome		
	BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		