**Avinashilingam Institute for Home Science and Higher Education for Women**
Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
**Coimbatore - 641 043, Tamil Nadu, India**

**Continuous Internal Assessment Test II – April 2025**

**VI Semester**

**Class: III UG** **Time: 2 Hrs**

**Major: Mathematics / Spl. Ed. & Mathematics** **Max. Marks: 60**

**21BMAC22/ 21BSMC18 – Real Analysis - II**

**Course Outcomes:**

CO1: Understand the differentiability of real functions and its related theorems.
CO2: Produce proper examples for continuous functions.
CO3: Distinguish continuity and uniform continuity.
CO4: Utilize the standard theorems on derivatives.
CO5: Apply the concept of bounded variation in continuous functions.

**PART-A** **6 x 1 = 6**

**Circle the correct answer**

1. If f is differentiable at c, then function f is/has ---------- at c. CO3K2

   a. continuous b. bounded c. discontinuous d. jump discontinuity

2. Every rational function has a …….. CO3 K3

   a. derivative wherever it is defined. b. derivative everywhere in R except at 0.

   c. derivative not everywhere in R d. discontinuity in R

3. If f and g are continuous on [a,b] and have equal finite derivatives in (a,b) then f-g is

   a. Increasing on [a,b] b. decreasing on [a,b]

   c. zero always on [a,b] d. constant on [a,b] CO4K3

4. Assume f has a derivative at each point of an open interval (a, b) and that f is continuous at the end points a and b. If $f'$ is zero everywhere in (a, b) then f is CO4 K2

   a. strictly increasing on [a,b] b. strictly increasing on (a,b)

   c. oscillating on [a,b] d. Constant on [a,b]

5. $V_f$ (a, b) = 0 if and only if f is constant on CO5K3

   a. (a, b) b. [a, b] c. (a, b] d. [a, b)

6. ---------- of $f'$ is not necessary for f to be of bounded variation. CO5K2

   a. Boundedness b.Continuity c. Differentiability d. both a and b

**PART – B** **3 x 6 = 18**

**Answer all the questions**

7.a. Let f be defined on an open interval (a,b) and assume that f has local maximum or a local minimum at an interior point c of (a,b). If f has a derivative at c, then $f'(c)$ must be zero. CO3K2

(or)

7.b. If f is defined on (a,b) and differential at a point c in (a,b), then there is a function $f^*$ which is continuous at c and which satisfies the equation $f(x) – f(c) = (x-c) f^*(x)$ for all in (a,b) with $f^*(c) = f'(c)$. Conversely if there is a function $f^*$ continuous at c, which satisfies the above equation then show that f is differential at c and $f'(c) = f^*(c)$. CO3K4

8. a. State and prove Rolle's Theorem CO4K3

(or)

8.b. State and prove Generalized Mean Value Theorem. CO4K3

9.a. If f and g are of bounded variation on [a, b], then prove that f+g is of bounded variation on [a, b]. CO5K4

(or)

9.b. (i) Define function f of bounded variation on [a,b].

(ii) If f is monotonic on [a,b] then show that f is of bounded variation on [a,b] CO5K2

**PART – C** **3 x 12 = 36**

**Answer all the questions**

10.a. State and prove chain rule for derivatives. CO3 K3

(or)

10.b. Illustrate the right hand derivative, left hand derivative and derivatives at an interior point using examples. CO3 K4

11.a. State and prove intermediate-value theorem for derivatives CO4 K3

(or)

11. b. State and prove Taylor's theorem CO4 K3

12.a. State and prove additive property of total variation. CO5 K3

(or)

12.b. Let f be bounded variation on [a,b]. If $x \in (a,b]$, let $V(x) = V_f(a,x)$ and put $V(a) = 0$, then show that every point of continuity of f is also a point of continuity of V. Prove the converse also. CO5 K2

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