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 I – August 2025

Semester I

Class : I UG **Time : 2 Hours**

Branch : Mathematics **Max.Marks : 60**

23BMAC01 – Calculus

Course Outcomes:

CO1: assimilate the notions of limit of a sequence and convergence of a series of real numbers.

CO2: calculate the limit and examine the continuity of a function at a point.

CO3: understand the consequences of various mean value theorems for differentiable functions.

CO4: sketch curves in Cartesian and polar coordinate systems.

CO5: apply derivative tests in optimization problems appearing in social sciences, physical sciences, life sciences and a host of other disciplines.

Part A **6 x 1 = 6**

Choose the Correct Answer

1. The Cantor set K is_____ CO1K1

a. Countable b. Uncountable c. finite d. bounded

2. A nonincreasing sequence which is not bounded below diverges to _____ CO1K2

a. infinity b. 0 c. minus infinity d. 1

3. The value of $\lim_{x\to 0} \frac{e^x - 1}{x}$ is CO2K2

a. 0 b. π c. π/2 d. 1

4. A function f defined on a finite interval is_____ CO2K1

a. continuous b. closed c. bounded d. finite

5. Limit of f(x) exists only if both the left hand and right hand limits exists and are _____ CO2K1

a. equal b. not equal c. equal to 1 d. equal to 0

6. The differentiable coefficient is also called the _____ CO3K1

a. interval b. function c. limit d. derivative

Part B **3 x 6 = 18**

Answer ALL questions

7.a.Prove that, The set [0,1] = {x| 0 ≤ x ≤ 1} is uncountable. CO1K4

(or)

7.b. Prove that a nondecreasing sequence which is bounded above is convergent. CO1K4

8.a. $Integrate\ \frac{1}{\sqrt{(2x^2-x+2)}}$ CO1K3

(or)

8.b. Examine whether the limit of the function $\frac{x^2-1}{x-1}$as x tends to 1 exists. CO2K3

9.a. State and prove Intermediate value theorem. CO2K2

(or)

9.b. Show that the function $f(x) = xtan^{-1}x\ when\ x \neq 0\ and\ f(0) = 0$ is continuous but not differentiable at x=0. CO3K3

Part C **3 x 12 = 36**

Answer ALL questions

10.a. (i) Show that the sequence $\{\left(1+\frac{1}{n}\right)^n\}_{n=1}^{\infty}$ is convergent. CO1K4

(ii) Integrate $(x+1)\sqrt{(x^2-x+1)}$

(or)

10.b.(i) Prove that $\int_0^{\frac{\pi}{2}} sin^m x cos^n x\ dx = \frac{\Gamma\left(\frac{m+1}{2}\right)\Gamma\left(\frac{n+1}{2}\right)}{2\Gamma\left(\frac{m+n+2}{2}\right)}$ CO1K4

(ii) Integrate $\frac{1}{sin^3 x cos^5 x}$

11.a. Prove that $\lim_{x\to 0}\frac{\tan x}{x} = 1$ CO2K4

(or)

11.b. Prove that if f and g be two functions such that $\lim_{x\to a} f(x) = A\ and$ CO2K4

$\lim_{x\to a} g(x) = B$ where A and B are finite, then

(i) $\lim_{x\to a}(kf)x = kA, where\ k\ is\ a\ constant$ (ii) $\lim_{x\to a}(f \pm g)x = A \pm B$

(iii) $\lim_{x\to a}(fg)x = AB$ (iv) $\lim_{x\to a}(f/g)x = A/B$

12.a. (i) List the different types of discontinuities. Explain it. CO2K3

(ii) Examine the continuity of the following function at the origin $f(x) = \frac{sin^2 ax}{x^2}$ $for\ x \neq 0, f(0) = 1.$

(or)

12.b. (i) Prove that if a function is differentiable at a point, then it is continuous at that point.

(ii) Show that the function f(x)=x sin (1/x). x≠0, f(0)=0 is continuous but not differentiable at x=0. CO3K4

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