School of University Polytechnic
Diploma in Civil Engineering
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

Sem II - N1DF201T - MATD1011 Applied Mathematics II

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) Find $\lim\limits_{x \to \pi/2} \dfrac{\sin\left(x - \frac{\pi}{2}\right)}{\left(\frac{\pi}{2} - x\right)}$.   K1 (2)

2) Explain the value of integral: $\int \dfrac{\cos x}{\sqrt{1 + \sin x}}\, dx$ K2 (4)

3) Show that $\lim\limits_{x \to a} \dfrac{x^m - a^m}{x^n - a^n} = \dfrac{m}{n} a^{m-n}$ K2 (6)

4) Solve thelf f: N→ N is defined by $f(n) = \begin{cases} \frac{n+1}{2}, & if\ n\ is\ odd \\ \frac{n}{2}, & if\ n\ is\ even \end{cases}$ for all n $\in\in$ N. State whether the function f is 1-1 and onto.   K3 (9)

5) Apply definite integral, find the area between the curves y = x and y = x².   K3 (9)

6) Prove that $\left[\dfrac{1 + \cos\theta + i\sin\theta}{1 + \cos\theta - i\sin\theta}\right]^n = \cos n\theta + i\sin n\theta$.   K5 (10)

7) Simplify Show that $(1 + i)^n + (1 - i)^n = 2^{\frac{n+2}{2}} \cos\dfrac{n\pi}{4}$.   K4 (12)

8) Evaluate the values of a and b so that the function f given by $f(x) = \begin{cases} 1, & if\ x \le 3 \\ ax + b, & if\ 3 < x < 5 \\ 7, & if\ x \ge 5 \end{cases}$ is continuous at x = 3 and x = 5   K5 (15)

9) Evaluate $\int_1^5 (|x - 1| + |x - 2| + |x - 4|)\, dx$:   K5 (15)

10) Solve the intervals for which function f(x) = (x⁴ - 4x³ + 4x² + 15) is Increasing and decreasing.   K6 (18)