PRN:		Course Code :	U01BS201

First Year **B. Tech.** End Semester Examination Winter 2024

Applied Mathematics-II 000081

Day and Date: Sat 14 DEC 2024 Max Marks: **50**

Time : 02:00PM To 04:00PM Duration: **02** hrs

Instructions: 1) All questions are compulsory.
2) Assume suitable data wherever necessary.
4) Non-programmable calculator is allowed.

Q.1	**Choose the most correct alternative.**	Marks	Bloom's Level	CO
1)	For any rational number n one of the values of $(\cos\theta + i\sin\theta)^n$ is	01	L2	CO1
	A) $(\sin n\theta + i\cos n\theta)$ C) $(\cos n\theta + i\sin n\theta)$			
	B) $(\tan n\theta + i\cot n\theta)$ D) $(\cos n\theta - i\sin n\theta)$			
2)	The complex number i can be represented in polar form as	01	L2	CO1
	A) $(\cos 0 + i\sin 0)$ C) $\left(\cos\frac{3\pi}{2} + i\sin\frac{3\pi}{2}\right)$			
	B) $(\cos\pi + i\sin\pi)$ D) $\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)$			
3)	Based on the definitions and properties of hyperbolic functions, which of the following is correct?	01	L2	CO2
	A) $\tanh(x) = \frac{e^{-x} - e^{x}}{e^{x} + e^{-x}}$ C) $\tanh(x) = \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}}$			
	B) $\tanh(x) = \frac{e^{-x} + e^{x}}{e^{x} + e^{-x}}$ D) $\tanh(x) = \frac{e^{-x} + e^{x}}{e^{x} - e^{-x}}$			
4)	Which of the following is correct?	01	L2	CO2
	A) $e^{-x} = \cosh x - \sinh x$ C) $e^{-x} = \cos x - i\sin x$			
	B) $e^{-x} = \cosh x + \sinh x$ D) $e^{-x} = 2\cosh x - \sinh x$			
5)	In the differential equation $Mdx + Ndy = 0$, is not exact but is of the form $yf_1(xy)dx + xf_2(xy)\,dy = 0$ then its I.F.is	01	L3	CO3
	A) $\frac{1}{Mx + Ny}$ $(Mx + Ny \neq 0)$ C) $e^{\int M\,dx}$			
	B) $\frac{1}{Mx - Ny}$ $(Mx - Ny \neq 0)$ D) $e^{\int N\,dy}$			

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6)	Which of the following equations is an exact DE?	01	L3	CO3

A) $\left(x^2+1\right)dx - xy\,dy = 0$, C) $2xy\,dx + \left(2+x^2\right)dy = 0$

B) $x\,dy + (3x-2y)\,dx = 0$, D) $x^2y\,dy - y\,dx = 0$

7)	The value of the integral $\int_0^{\pi/2} \sin^6\theta d\theta$	01	L3	CO4

A) $\frac{15\pi}{96}$ B) $\frac{5\pi}{96}$ C) $\frac{51\pi}{96}$ D) $\frac{15\pi}{69}$

8)	Using factorial representation of the Gamma function, which of the following is the solution for $\lceil n$ when $n=8$?	01	L3	CO4

A) 16,777,216 B) 362,880 C) 40,320 D) 5040

9)	The value of $\int_0^3 \int_0^2 x\,dx\,dy$ is	01	L2	CO4

A) 5 B) 6 C) 7 D) 8

10)	The value of $\int_0^a \int_0^b dy\,dx$ is	01	L2	CO4

A) ab B) a C) b D) $-ab$

Q.2 **Attempt any Two the following**

a)	Simplify $\frac{(\cos 2\theta - i\sin 2\theta)^7 (\cos 3\theta + i\sin 3\theta)^{-5}}{(\cos 4\theta + i\sin 4\theta)^{12} (\cos 5\theta - i\sin 5\theta)^{-4}}$.	05	L2	CO1
b)	Show that $(1+i)^n + (1-i)^n = 2^{\left(\frac{n}{2}+1\right)} \cos\left(\frac{n\pi}{4}\right)$ for integer values of n.	05	L2	CO1
c)	Expand sin5θ, cos5θ and hence find tan5θ.	05	L3	CO1

Q.3 **Attempt any Two the following**

a)	Prove that $\left[\frac{1+\tanh x}{1-\tanh x}\right]^n = \cosh 2nx + \sinh 2nx$,	05	L2	CO2
b)	Prove that $\tanh^{-1} x = \frac{1}{2}\log\left(\frac{1+x}{1-x}\right)$.	05	L2	CO2
c)	Evaluate $\int_0^a \int_0^{2\sqrt{ax}} x^2 dy dx$.	05	L2	CO4

Q.4 **Attempt any Two the following**

a)	Solve $(x^2+y^2)dx - 2xydy = 0$.	05	L1	CO3

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b)	Solve $\frac{dy}{dx}=\frac{y}{2y\log y+y-x}$.	05	L1	CO3
c)	Evaluate $\int_0^{\pi/2}\int_0^{a\cos\theta} r^2 dr d\theta$.	05	L2	CO4

Q.5 **Attempt any Two the following**

a)	Evaluate $\int_0^1 \left[x\log\left(\frac{1}{x}\right)\right]^{-1/2} dx$.	05	L2	CO4
b)	Evaluate $\int_0^1 x^5\left(1-x^3\right)^{10} dx$.	05	L4	CO4
c)	Change the order of integration $\int_0^5\int_{2-x}^{2+x} f(x,y)\,dydx$.	05	L4	CO4

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