INDIAN INSTITUTE OF INFORMATION TECHNOLOGY UNA [HP]

An Institute of National Importance under MoE

Saloh, Una (HP) – 177 209

Website: www.iiitu.ac.in

AY 2021-22

School of Computing

CURRICULUM: IIITUGCSE20

Cycle Test – II

28-03-2022

Degree	B. Tech.	**Branch**	CSE
Semester	I		
Subject Code & Name	MAC111: Engineering Mathematics		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

Sl. No.	Question	Marks
1.a	Find c of Lagrange's mean value theorem for the function $f(x)=e^x$ in $[0,1]$.	(1)
1.b	If $x=u+v+w,\ y=uv+vw+uw,\ z=uvw$ and F is a function of x, y, z, show that $u\frac{\partial F}{\partial u}+v\frac{\partial F}{\partial v}+w\frac{\partial F}{\partial w}=x\frac{\partial F}{\partial x}+2y\frac{\partial F}{\partial y}+3z\frac{\partial F}{\partial z}$.	(2)
1.c	If $z(x+y)=x^2+y^2$, show that $\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2=4\left(1-\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)$.	(2)
2.a	Using ε,δ definition, show that $\lim\limits_{x\to 1}\frac{x^2+2x-3}{x-1}=4,\ x\neq 1$.	(1)
2.b	Find the area between the parabola $x^2=4ay$ and the curve $y(x^2+4a^2)=8a^3$.	(2)

2.c	If $f(x)=\dfrac{\left(5^x-2^x\right)x}{\cos 5x-\cos 3x}, x\neq 0$ is continuous at x=0, then find f (0).	(2)
3.a	Define Linear span of a set.	(1)
3.b	V is the set of all polynomials over real numbers of degree at most one and F=R. $f(t)=a_0+a_1t,\ g(t)=b_0+b_1t$ in V; define $f(t)+g(t)=(a_0+b_0)+(a_0b_1+a_1b_0)t$ and $kf(t)=ka_0+(ka_1)t,\ k\in F$. Show that V (F) is not a vector space.	(2)
3.c	Show that the solutions of the differential equation $\left(D^2-5D+6\right)y=0$ is a subspace of the vector space of all real valued continuous functions over R.	(2)
4.a	Define postulates of the Abelian group with respect to addition.	(1)
4.b	Let F[x] be the vector space of all polynomials over the field F. Show that the infinite set $S=\left\{1,x,x^2,.......\right\}$ is linearly independent.	(2)
4.c	Let W_1 and W_2 be two subspaces of a vector space V such that $W_1+W_2=V$ and $W_1\cap W_2=\left\{\bar{0}\right\}$. Prove that for each vector α in V there are unique vectors $\alpha_1\in W_1,\ \alpha_2\in W_2$ such that $\alpha=\alpha_1+\alpha_2$.	(2)