DEPARTMENT OF MATHEMATICS

Course: NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS	Improvement QUIZ	Maximum marks: 10
Course code: 22MA21C	Second semester 2022-2023 Physics Cycle Branch: AI, BT, CD, CS, CY, IS, SPARK-C	Time: 20 Minutes Date: 06-09-2023

Name:	Branch:	USN:

***Instructions to students**: Rough work can be done at the backside of the sheet.*

Q.No	Quiz questions	M	BT	CO
1.1	The value of $\Delta^4[(4+2x)(2-x)(1-3x^2)]$ taking the interval of differencing $h=1$ is _____. **Ans: 144**	1	L1	1
1.2	A vector point function $\vec{F}$ is irrotational if _____. **Ans: $curl(\vec{F})=0$**	1	L1	1
1.3	If vector $\vec{f}=ax\hat{\imath}-2y\hat{\jmath}+z\hat{k}$ is solenoidal, then the value of the constant 'a' is _____. **Ans: $a=1$**	1	L1	1
1.4	If $\nabla\phi=2\sqrt{6}\hat{\imath}+11\hat{\jmath}-5\hat{k}$ then the directional derivative along the direction of the vector $\sqrt{6}\hat{\imath}+3\hat{\jmath}-7\hat{k}$ is _____. **Ans: 10**	1	L1	2
1.5	A particle moves along the curve $x=e^{-t},\ y=2\cos 3t,\ z=2\sin 3t,$ the velocity vector at $t=0$ is _____ and acceleration vector at $t=0$ is_____ **Ans: $\left(\frac{d\vec{r}}{dt}\right)_{t=0}=-\hat{\imath}+6\hat{k}$ and $\left(\frac{d^2\vec{r}}{dt^2}\right)_{t=0}=\hat{\imath}-18\hat{\jmath}$**	2	L1	1
1.6	The unit normal vector to the surface $3x^2+y^3z^2+5=0$ at $(-1,-1,2)$ is _____. **Ans: $\frac{-6\hat{\imath}+12\hat{\jmath}-4\hat{k}}{14}$**	2	L2	2
1.7	Using suitable interpolation, fit a polynomial for the data x: 1, 2, 4 y: 6, 2, 0 **Ans: $x^2-7x+12$**	2	L2	3

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1.1	The value of $\Delta^4[(3+x)(1+4x^2)(5-2x)]$ taking the interval of differencing $h=1$ is _____. **Ans : -192**	1	L1	1
1.2	A vector point function $\vec{g}$ is said to be conservative if _____. **Ans: $curl(\vec{g})=0$.**	1	L1	1
1.3	If vector $\vec{f}=3x\hat{\imath}-by\hat{\jmath}+2z\hat{k}$ is solenoidal, then the value of the constant 'b' is _____. **Ans: $b=5$**	1	L1	1
1.4	If $\nabla\phi=\sqrt{2}\hat{\imath}+\sqrt{3}\hat{\jmath}-\sqrt{6}\hat{k}$ then the directional derivative along the direction of the vector $3\sqrt{2}\hat{\imath}+2\sqrt{3}\hat{\jmath}-\sqrt{6}\hat{k}$ is _____. **Ans: 3**	1	L1	2
1.5	A particle moves along the curve $x=1-t^3,\ y=4t^3+3,\ z=2t-7,$ the velocity vector at $t=1$ is _____ and acceleration vector at $t=2$ is_____. **Ans: $\left(\frac{d\vec{r}}{dt}\right)_{t=1}=-3\hat{\imath}+12\hat{\jmath}+2\hat{k}$ and $\left(\frac{d^2\vec{r}}{dt^2}\right)_{t=2}=-12\hat{\imath}+48\hat{\jmath}$**	2	L1	1
1.6	The unit normal vector to the surface $4x-5y+z^2+5=0$ at $(1,2,-1)$ is _____. **Ans: $\frac{4\hat{\imath}-5\hat{\jmath}-2\hat{k}}{\sqrt{45}}$**	2	L2	2
1.7	Using suitable interpolation, fit a polynomial for the data x: 1, 3, 4 y: 3, 7, 0 **Ans: $-3x^2+14x-8$**	2	L2	3

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1.1	The value of $\Delta^3[(7+4x)(1-2x)(5+x)]$ taking the interval of differencing $h=2$ is _____. **Ans: -384**	1	L1	1
1.2	Curl of a constant vector is _____. **Ans: Zero vector**	1	L1	1
1.3	If vector $\vec{f}=7x\hat{\imath}+6y\hat{\jmath}+mz\hat{k}$ is solenoidal, then the value of the constant 'm' is _____. **Ans: $m=-13$**	1	L1	1
1.4	If $\nabla\phi=10\hat{\imath}-7\hat{\jmath}+2\hat{k}$ then the directional derivative along the direction of the vector $3\hat{\imath}-2\hat{\jmath}+6\hat{k}$ is _____. **Ans: 8**	1	L1	2
1.5	A particle moves along the curve $x=t^3-4t,\ y=t^2+4t,\ z=8t^2-5,$ the velocity vector at $t=2$ is _____ and acceleration vector at $t=0$ is_____. **Ans: $\left(\frac{d\vec{r}}{dt}\right)_{t=2}=8\hat{\imath}+8\hat{\jmath}+32\hat{k}$ and $\left(\frac{d^2\vec{r}}{dt^2}\right)_{t=0}=2\hat{\jmath}+16\hat{k}$**	2	L1	1
1.6	The unit normal vector to the surface $x^2+y^2=6z+14$ at $(1,1,-2)$ is _____. **Ans: $\frac{2\hat{\imath}+2\hat{\jmath}-6\hat{k}}{\sqrt{44}}$**	2	L2	2
1.7	Using suitable interpolation, fit a polynomial for the data x: -2, 1, 2 y: 3, 0, 7 **Ans: $2x^2+x-3$**	2	L2	3

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1.1	The value of $\Delta^3[(3+x)(1+3x)(1+4x)]$ taking the interval of differencing $h=2$ is _____. **Ans: 576**	1	L1	1
1.2	Curl of the position vector $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$ is _____. **Ans: Zero vector**	1	L1	1
1.3	If vector $\vec{f} = 2ax\hat{\imath} - ay\hat{\jmath} + 4z\hat{k}$ is solenoidal, then the value of the constant 'a' is _____. **Ans: $a = -4$**	1	L1	1
1.4	If $\nabla\phi = 6\hat{\imath} + 8\hat{\jmath} - 7\hat{k}$ then the directional derivative along the direction of the vector $2\hat{\imath} - \hat{\jmath} - 2\hat{k}$ is _____. **Ans: 6**	1	L1	2
1.5	A particle moves along the curve $x = 4\sin t$, $y = 4\cos t$, $z = 3t^2$, the velocity vector at $t = \pi$ is _____ and acceleration vector at $t = 0$ is_____. **Ans: $\left(\frac{d\vec{r}}{dt}\right)_{t=\pi} = -4\hat{\imath} + 6\pi\hat{k}$ and $\left(\frac{d^2\vec{r}}{dt^2}\right)_{t=0} = -4\hat{\jmath} + 6\hat{k}$**	2	L1	1
1.6	The unit normal vector to the surface $y^2 - 4x^2 + 3z = 3$ at $(1,-2,1)$ is **Ans: $\frac{-8\hat{\imath}-4\hat{\jmath}+3\hat{k}}{\sqrt{89}}$**	2	L2	2
1.7	Using suitable interpolation, fit a polynomial for the data x: 0, 2, 3 y: 2, 0, 8 **Ans: $3x^2 - 7x + 2$**	2	L2	3

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