DEPARTMENT OF MATHEMATICS

Course: NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS	QUIZ - I	Maximum marks: 10
Course code: 22MA21C	First semester 2022-2023 Physics Cycle Branch: AI, BT, CD, CS, CY, IS, SPARK-P	Time: 20 Minutes Date: 05-07-2023

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	Using suitable interpolation, fit a polynomial for the data x: -1, 2, 4 y: -5, 4, 0 **Ans: $4x - x^2$**	2	L2	3
1.2	If $f(8) = 10,\ f(10) = 19,\ f(12) = 32.5,\ f(14) = 54,\ f(16) = 89.5$, then $\Delta^2 f(12) =$_____ **Ans: 14**	1	L1	1
1.3	The value of $\Delta^3[(1+3x)(1-5x)(1-4x)]$ taking the interval of differencing $h = 1$ is _____. **Ans: 360**	1	L1	1
1.4	The particular solution of the initial value problem $y'' + y' + 0.25y = 0$ with $y(0) = 3$ and $y'(0) = -3.5$ is _____. **Ans: $(3 - 2x)e^{-x/2}$**	2	L2	2
1.5	Particular integral of $2\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 2y = e^{x/2}$ is _____. **Ans: $\frac{xe^{x/2}}{5}$**	1	L2	2
1.6	If $x = e^{-3t}$ is the solution of the differential equation $\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + kx = 0$, then $k =$ _____. **Ans: $k = 3$**	1	L1	1
1.7	Given x: 0, 2, 4, 6 $f(x)$: 7, 13, 43, 145 The value of $f'(2) =$_____. **Ans: -3**	2	L2	1

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Q.No	Quiz questions	M	BT	CO
1.1	Using suitable interpolation, fit a polynomial for the data x: -1, 3, 4 y: -4, 0, 6 **Ans: $x^2 - x - 6$**	2	L2	3
1.2	If $f(1) = 0,\ f(1.2) = 0.128,\ f(1.4) = 0.544,\ f(1.6) = 1.296,\ f(1.8) = 2.432$, then $\nabla^2 f(1.6) =$_____ **Ans: 0.336**	1	L1	1
1.3	The value of $\Delta^6[(2-3x)(3-4x^2)(2+5x^3)]$ taking the interval of differencing $h = 1$ is _____. **Ans: 43200**	1	L1	1
1.4	The particular solution of the initial value problem $9y'' + 6y' + y = 0$ with $y(0) = 4$ and $y'(0) = -\frac{13}{3}$ is _____. **Ans: $(4 - 3x)e^{-x/3}$**	2	L2	2
1.5	Particular integral of $4\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 10y = e^{-2x}$ is _____. **Ans: $-\frac{xe^{-2x}}{13}$**	1	L2	2
1.6	If the roots of the auxiliary equation are -2 and 3, then the corresponding differential equation is _____. **Ans: $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 0$**	1	L1	1
1.7	Given x: 1, 3, 5, 7 $f(x)$: 2, 7, 16, 29 The value of $f'(7) =$_____. **Ans: 7.5**	2	L2	1

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Q.No	Quiz questions	M	BT	CO
1.1	Using suitable interpolation, fit a polynomial for the data x: 2, 4, 5 y: 0, 6, 12 **Ans: $x^2 - 3x + 2$**	2	L2	3
1.2	If $f(0.2) = 0.0350,\ f(0.4) = 0.1170,\ f(0.6) = 0.2165,\ f(0.8) = 0.2995,\ f(1) = 0.3340$, then $\Delta^2 f(0.8) =$_____ **Ans: Does not exist**	1	L1	1
1.3	The value of $\Delta^3[(1-x)(1-3x)(1-5x)]$ taking the interval of differencing $h = 2$ is _____. **Ans: -720**	1	L1	1
1.4	The particular solution of the boundary value problem $y'' + y = 0$ with $y(0) = 1$ and $y\left(\frac{\pi}{2}\right) = 2$ is _____. **Ans: $\cos x + 2\sin x$**	2	L2	2
1.5	Particular integral of $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 3^x + e^x$ is _____. **Ans: $\frac{e^x}{10} + \frac{3^x}{(\log_e 3)^2 + 4\log_e 3 + 5}$**	1	L2	2
1.6	If the complementary function of the differential equation is $y = (c_1 + c_2 x)e^{-2x}$, then the corresponding differential equation is _____. **Ans: $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 0$**	1	L1	1
1.7	Given x: 20, 25, 30, 35 $f(x)$: 354, 332, 291, 260 The value of $f'(30) =$_____. **Ans: -10.1**	2	L2	1

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Q.No	Quiz questions	M	BT	CO
1.1	Using suitable interpolation, fit a polynomial for the data x: 3, 4, 8 y: 5, 8, 0 **Ans: $-x^2+10x-16$**	2	L2	3
1.2	If $f(1)=7.4036,\ f(2)=7.7815,\ f(3)=8.1311,\ f(4)=8.4554,\ f(5)=8.7574$, then $\nabla^2 f(4)=$_____ **Ans: -0.0253**	1	L1	1
1.3	The value of $\Delta^4[(1-2x)(1-3x)(1-5x)(1-6x)]$ taking the interval of differencing $h=2$ is _____. **Ans: 69120**	1	L1	1
1.4	The particular solution of the initial value problem $9y''-25y=0$ with $y(0)=0$ and $y'(0)=-5$ is _____. **Ans: $-1.5e^{\frac{5x}{3}}+1.5e^{-\frac{5x}{3}}$**	2	L2	2
1.5	Particular integral of $3\frac{d^2y}{dx^2}-2\frac{dy}{dx}-5y=e^{5x/3}$ is _____. **Ans: $\frac{xe^{\frac{5x}{3}}}{8}$**	1	L2	2
1.6	If $x=e^{-t}$ is the solution of the differential equation $\frac{d^2x}{dt^2}-6\frac{dx}{dt}-nx=0$, then $n=$ _____. **Ans: $n=7$**	1	L1	1
1.7	Given x: 1, 4, 7, 10 $f(x)$: 416, 240, 212, 135 The value of $f'(1)=$_____. **Ans: -105.2222**	2	L2	1

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DEPARTMENT OF MATHEMATICS

Course: NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS	QUIZ - II	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: 16-08-2023

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 Wronskian of the function $u = e^{2x}$ and $v = xe^{2x}$ is _____. **Ans:** $\boldsymbol{e^{4x}}$	2	L2	2
1.2	Reduce the Cauchy-Euler differential equation $x^2\frac{d^2y}{dx^2} - 7x\frac{dy}{dx} + 16y = \log_e(x)$ to linear differential equation with constant coefficients. **Ans:** $\boldsymbol{(D_1^2 - 8D_1 + 16)y = z, \quad D_1 = \frac{d}{dz}}$	1	L1	1
1.3	The number of integers less than 176 that are relatively prime to 176 is _____. **Ans: 80**	1	L2	2
1.4	Non-negative remainder obtained when $1! + 2! + 3! + \cdots + 100!$ is divided by 12 is _____. **Ans: 9**	1	L1	1
1.5	The number of positive divisors of the integer 1363 is_____. **Ans: 4**	1	L1	1
1.6	If $720 = 2^a3^b5^c$, where a, b, c are positive integers, then the product of a, b, c is_____. **Ans: 8**	1	L1	1
1.7	The multiplicative inverse of 7 $(mod\ 23)$ is _____. **Ans: 10**	1	L2	2
1.8	Remainder obtained when 21^{875} is divided by 17 is _____. **Ans: 13**	2	L2	2

DEPARTMENT OF MATHEMATICS

Course: NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS	**QUIZ - II**	**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: 16-08-2023**

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 Wronskian of the function $u = \sin\left(\frac{x}{2}\right)$ and $v = \cos\left(\frac{x}{2}\right)$ is _____. **Ans:** $-\frac{1}{2}$	2	L2	2
1.2	Reduce the Cauchy-Euler differential equation $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 2y = x\sin(\log_e(x))$ to linear differential equation with constant coefficients. **Ans:** $(D_1^2 - 2D_1 + 2)y = e^z\, sin(z), \quad D_1 = \frac{d}{dz}$	1	L1	1
1.3	The number of integers less than 223 that are relatively prime to 223 is _____. **Ans: 222**	1	L2	2
1.4	Non-negative remainder obtained when $1! + 2! + 3! + \cdots + 100!$ is divided by 14 is _____. **Ans: 5**	1	L1	1
1.5	The number of positive divisors of the integer 1412 is_____. **Ans: 6**	1	L1	1
1.6	If $1008 = 2^p 3^q 7^r$, where p, q, r are positive integers, then the sum of p, q, r is_____. **Ans: 7**	1	L1	1
1.7	The multiplicative inverse of 12 $(mod\ 19)$ is _____. **Ans: 8**	1	L2	2
1.8	Remainder obtained when 51^{733} is divided by 29 is _____. **Ans: 13**	2	L2	2

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

Q.No	Quiz questions	M	BT	CO
1.1	The Wronskian of the function $u = e^{-3x}$ and $v = e^{x/5}$ is _____. **Ans:** $\frac{16}{5}e^{-\frac{14}{5}x}$	2	L2	2
1.2	Reduce the Cauchy-Euler differential equation $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 12y = x^2\log_e(x)$ to linear differential equation with constant coefficients. **Ans:** $(D_1^2 + D_1 - 12)y = e^{2z}\,z, \quad D_1 = \frac{d}{dz}$	1	L1	1
1.3	The number of integers less than 247 that are relatively prime to 247 is _____. **Ans: 216**	1	L2	2
1.4	Non-negative remainder obtained when $1! + 2! + 3! + \cdots + 100!$ is divided by 7 is _____. **Ans: 5**	1	L1	1
1.5	The number of positive divisors of the integer 1881 is_____. **Ans: 12**	1	L1	1
1.6	If $693 = 3^k 7^l 11^m$, where k, l, m are positive integers, then the sum of k, l, m is_____. **Ans: 4**	1	L1	1
1.7	The multiplicative inverse of 11 $(mod\ 27)$ is _____. **Ans: 5**	1	L2	2
1.8	Remainder obtained when 71^{717} is divided by 23 is _____. **Ans: 4**	2	L2	2

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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 Wronskian of the function $u = xe^{4x}$ and $v = e^{4x}$ is _____. **Ans:** $-e^{8x}$	2	L2	2
1.2	Reduce the Cauchy-Euler differential equation $x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + 5y = x^3\cos(\log_e(x))$ to linear differential equation with constant coefficients. **Ans:** $(D_1^2 + 2D_1 + 5)y = e^{3z}cos(z), \quad D_1 = \frac{d}{dz}$	1	L1	1
1.3	The number of integers less than 301 that are relatively prime to 301 is _____. **Ans: 252**	1	L2	2
1.4	Non-negative remainder obtained when $1! + 2! + 3! + \cdots + 100!$ is divided by 8 is _____. **Ans: 1**	1	L1	1
1.5	The number of positive divisors of the integer 1045 is_____. **Ans: 8**	1	L1	1
1.6	If $882 = 2^x3^y7^z$, where x, y, z are positive integers, then the product of x, y, z is_____. **Ans: 4**	1	L1	1
1.7	The multiplicative inverse of 13 $(mod\ 29)$ is _____. **Ans: 9**	1	L2	2
1.8	Remainder obtained when 47^{757} is divided by 19 is _____. **Ans: 9**	2	L2	2

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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Name:	Branch:	USN:

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Q.No	Quiz questions	M	BT	CO
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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Q.No	Quiz questions	M	BT	CO
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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Q.No	Quiz questions	M	BT	CO
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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