MANIPAL ACADEMY of HIGHER EDUCATION (Institution of Eminence Deemed to be University)

Reg.No.									

DEPARTMENT OF SCIENCES, III SEMESTER B.Tech. (Printing & Media)
END SEMESTER EXAMINATIONS, January 2023
ENGINEERING MATHEMATICS III [MAT 2156]

Time: 3 Hours MAX. MARKS: 50

Note (i) Answer ALL questions

		Marks	CO	BL
1A	Find the half range sine series expansion of function $f(x) = x^2$, where $0 < x < 3$.	3	1	3
1B	Compute first harmonics of the Fourier series of $y = f(x)$ given by the following table x: 0°, 60°, 120°, 180°, 240°, 300° y: 9, 18, 24, 28, 26, 20	3	1	3
1C	Obtain the Fourier series for $f(x) = \begin{cases} -\pi & -\pi < x < 0 \\ x & 0 < x < \pi \end{cases}$.	4	1	3

		Marks	CO	BL
2A	Calculate the coefficient of kurtosis γ_2 for the following data x: 0, 1, 2, 3, 4, 5, 6, 7, 8 f: 1, 8, 28, 56, 70, 56, 28, 8, 1	3	2	3
2B	Calculate mean, median and mode for the following data: Class interval: 0-10, 10-20, 20-30, 30-40, 40-50 Frequency: 12, 16, 6, 7, 9	3	2	3
2C	If P is the pull required to lift a load W by the means of a pulley block, then find a linear law of the form $P = mW + c$, connecting P and W using data P: 12, 15, 21, 25 W(in Kg): 50, 70, 100, 120 Compute P, when $W = 150$ Kg.	4	3	4

		Marks	CO	BL
3A	Two lines of regression of x and y are $3x + y - 12 = 0$ and $x + 2y - 14 = 0$. Find the mean of x, mean of y and regression coefficient between x and y.	3	2	3
3B	Find a unit vector normal to the surface $x^3 + y^3 + 3xyz = 3$ at the point $(1,2,-1)$.	3	3	2
3C	Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)\hat{\imath} - 2xy\hat{\jmath}$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$ and $y = b$.	4	4	3

		Marks	CO	BL
4A	Find the work done in moving a particle in the force field $\vec{F} = 3x^2\hat{\imath} + (2xz - y)\hat{\jmath} + z\hat{k}$ along the curve C defined by $x^2 = 4y$, $3x^3 = 8z$ from $x = 0$ to $x = 2$.	3	3	3
4B	Solve the partial differential equation $$\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y,$$ where $z = 0$ when $y = \frac{\pi}{2}$ and $\frac{\partial z}{\partial y} = -2 \sin y$ when $x = 0$.	3	5	2
4C	Verify the Green's theorem for $$\int_C (xy^2 + x^2)dx + (4x - 1)dy$$ where the curve C enclose the region bounded by x-axis, y-axis and the straight line $y - x = 3$.	4	4	4

		Marks	CO	BL
5A	Solve the partial differential equation $$x\frac{\partial u}{\partial x} - y\frac{\partial u}{\partial y} = 2x^2$$ using indicated transformations $s = xy$ and $t = x/y$.	3	5	3
5B	Find d'Alembert's solution of one-dimensional wave equation $$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}.$$	3	5	3
5C	Solve following one-dimensional heat equation using separation of variables- $$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$ where $u(0, t) = u(1, t) = 0$ and $u(x, 0) = f(x)$.	4	5	4