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III SEMESTER B.TECH. (ECE/EEE/EI/BME)
END SEMESTER GRADE IMPROVEMENT/MAKEUP EXAMINATIONS- JULY/AUGUST 2021

SUBJECT: ENGINEERING MATHEMATICS-III [MAT 2152]

REVISED CREDIT SYSTEM

Time: 2 Hours Date:23-07-2021 MAX. MARKS: 40

Instructions to Candidates:

- Answer **ANY FOUR** questions. All questions carry equal marks.

1A.	Obtain the Fourier series of $f(x) = e^{-x},\ x \in (0,2\pi),\ f(x+2\pi) = f(x)\ \forall\ x.$
1B.	Obtain the half range cosine series of $f(x) = x,\ x \in (0,2)$
2A.	Find the Fourier cosine transform of e^{-x} and hence find the sine transform of $\frac{x}{1+x^2}$.
2B.	Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & \lvert x\rvert \le a \\ 0, & \lvert x\rvert > a \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt.$
3A.	Prove that the function $u(x,y) = coshx \cos y$ is harmonic and find its harmonic conjugate.
3B.	If f(z) is an analytic function of z, prove that $\left(\frac{\partial}{\partial x^2}^2 + \frac{\partial}{\partial y^2}^2\right) \boldsymbol{log\lvert f(z)\rvert = 0}.$
4A.	Expand $f(z) = \frac{z-1}{(z-2)(z-3)^2}$ as a Laurent's series valid for i) $\lvert z\rvert > 3$ ii) $2 < \lvert z\rvert < 3.$
4B.	Evaluate: $\oint_C \frac{3z^2+z+1}{(z^2-1)(z+3)} dz$ where C is the circle $C: \lvert z\rvert = 2.$
5A.	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x + y + z^2 = 5$ at the point (2, -1, 2).

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5B.	Show that $\vec{F} = (2xy + z^3)i + x^2j + 3xz^2k$ is conservative, find its scalar potential and work done in moving an object in this field from $(1, -2, 1)$ to $(3, 1, 4)$.
6A.	Solve $U_{xx} + U_{xy} - 2U_{yy} = 0$ using the transformations $v = x + y, z = 2x - y.$
6B.	Assuming the most general solution, find the deflection u(x,t) of the vibrating string of length π units fixed at both ends and vibrating with zero initial velocity and initial deflection u(x,0) = x($\pi - x$) .