III SEMESTER B.TECH. (CHEM/BT)

END SEMESTER ONLINE EXAMINATIONS, JULY 2021

SUBJECT: ENGINEERING MATHEMATICS [MAT 2153]

REVISED CREDIT SYSTEM

Time: 2 Hours MAX. MARKS: 40

Instructions to Candidates:

- Answer **ANY FOUR FULL** questions.
- Missing data may be suitable assumed.

1A.	Verify Greens theorem for $\oint_c F.dr$ where C is the boundary the region formed by the points (0,0), (2,0) and (2,1) and $F=(2x+y^2)i+(3y-4x)j$	**5**
1B.	Evaluate $\iint_S F.nds$ where $A=2x^2yi-y^2j+4xz^2k$ and n is the surface of the region in the first octant bounded by $y^2+z^2=9$ and x=2.	**5**
2A.	Evaluate the integral $\oint_c \frac{z^2-z+2}{z^3+2z}dz$, where C is the boundary of the rectangle with vertices $3\pm i$, $-1\pm i$.	**6**
2B.	Find all possible expansions of f(z)= $\frac{1}{z^2}$ about z=i	**4**
3A.	Find Fourier sine transform $e^{-ax}\cos ax$ and deduce the Fourier sine transform of $(x^4+k^4)^{-1}$.	**5**
3B.	Find Fourier transform of $f(x)=\begin{cases} a^2-x^2 & for \quad |x|<a \\ 0 & for \quad |x|>a>0 \end{cases}$. Hence deduce that $\int_0^\infty \frac{(\sin t - t\cos t)^2}{t^6}dt=\frac{\pi}{15}$.	**5**
4A.	Find the Fourier series expansion of f(x)=xcosx, $0<x<2\pi$, f(x+2π)=f(x).	**5**

4B.	Find the half range Fourier cosine series of $f(x) = e^x$ in (0,1).	**5**
5A.	A tightly stretched string with end points fixed at x=0 and x=2 is in initial equilibrium position and it is set to vibrate by giving initial velocity $3(2x - x^2)$. Find the displacement of the string at time t.	**5**
5B.	The ends of a rod of length 30cms have temperature 20^0 C and 80^0 C until the steady state condition prevails. Temperature at the ends was suddenly brought to $0^0 C$ and kept so. Find the temperature distribution in the rod at time t.	**5**
6A.	If $u = r^2 \sin 2\theta + r \sin \theta$, find the conjugate harmonic of u and corresponding analytic function f(z)=u(z)+iv(z)(in terms of z).	**5**
6B.	If f(z) =u+iv is an analytic function, then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \log_e \lvert f(z) \rvert$.	**5**

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