Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. (ECE/EEE/EI/BME)

END SEMESTER EXAMINATIONS, NOVEMBER 2019

SUBJECT: ENGINEERING MATHEMATICS-III [MAT 2152]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.

1A.	Find the Fourier series expansion of $f(x) = x - x^2, \quad -1 < x < 1.$ $f(x+2) = f(x)\ \forall x$ and hence evaluate $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$.	**4**
1B.	Find the half range cosine series of $f(x) = x\sin x \ \ in \ \ 0 < x < \pi.$	**3**
1C.	Find the Fourier sine and cosine transform of xe^{-ax}.	**3**
2A.	Find the Fourier transform of $f(x) = \begin{cases} 1-\lvert x\rvert, & \lvert x\rvert < 1 \\ 0, & \lvert x\rvert > 1 \end{cases}$ and hence deduce that $\int_0^{\infty} \left(\frac{sint}{t}\right)^4 dt = \frac{\pi}{3}$	**4**
2B.	Find the analytic function f(z) = u+iv for which $v = e^{-x}(xsiny - ycosy)$.	**3**
2C.	If f(z) = u + iv is analytic function of z, show that $\left\{\frac{\partial}{\partial x}\lvert f(z)\rvert\right\}^2 + \left\{\frac{\partial}{\partial y}\lvert f(z)\rvert\right\}^2 = \lvert f'(z)\rvert^2$.	**3**
3A.	Find all the possible expansions of $f(z) = \frac{1}{z^2-5z+6}$ about the point z = 1.	**4**
3B.	Evaluate: $\oint_C \frac{3z^2+2}{(z-1)(z^2+9)}dz, \quad C:\lvert z\rvert = 4.$	**3**
3C.	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9 \ \ and \ z = x^2 + y^2 - 3$ at (2,-1,2).	**3**

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4A.	Verify Greens Theorem for $\oint_C \left(3x^2 - 8y^2\right)dx + \left(4y - 6xy\right)dy$ where C is the boundary of the region defined by $x = 0, y = 0$ and $x + y = 1$.	**4**
4B.	Show that $\vec{F} = (2xzcosy + y + 2)\hat{\imath} + (x - x^2z\, siny + z)\hat{\jmath} + (x^2cosy + y + 3)\hat{k}$ is conservative, find its scalar potential and work done in moving an object in this field from $(1, 0, 2)$ to $\left(2, \frac{\pi}{2}, 1\right)$.	**3**
4C.	Find the div $\vec{F}$ and curl $\vec{F}$ when $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$.	**3**
5A.	Evaluate $\oiint_S \vec{A}.\hat{n}dS$ where $\vec{A} = (2x - y)\hat{\imath} - 2y\hat{\jmath} - 4z\hat{k}$ and S is the surface of the region bounded by $x = 0, y = 0, z = 0, z = 3$ and $x^2 + y^2 = 16$ lying in the first octant.	**4**
5B.	Solve $u_{xx} + 2u_{xy} + u_{yy} = 0$ using the transformation $v = x$, z = x – y.	**3**
5C.	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($\pi - x$) .	**3**