Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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A Constituent Institution of Manipal University

III SEMESTER B.TECH. (E&C/EE/ICE/BM ENGINEERING)

MAKEUP EXAMINATIONS, DEC. 2016

SUBJECT: ENGINEERING MATHEMATICS-III [MAT 2102]

REVISED CREDIT SYSTEM
(28/12/2016)

Time: 3 Hours | MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.

1A.	Find the half range Fourier cosine series expansion of $f(x)=\begin{cases} x, & 0<x<\frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2}\le x<\pi \end{cases}$ Also draw the graph of corresponding periodic extension of f(x).	**3**
1B.	Find the Fourier transform of $f(x)=\begin{cases} 1-\lvert x\rvert, & \lvert x\rvert\le 1 \\ 0, & \lvert x\rvert>1 \end{cases}$ *and hence evaluate* $\int_0^{\infty}\left(\frac{\sin t}{t}\right)^2 dt.$	**3**
1C.	Expand $f(x)=x-x^2 \; -l\le x\le l,\; f(x+2l)=f(x)$, as a Fourier series and hence evaluate $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^2}$.	**4**
2A.	Find the Fourier sine transform of $x^{a-1}, 0<a<1$, and hence find $F_S\left\{\frac{1}{\sqrt{x}}\right\}$	**3**
2B.	Find the analytic function f(z) = u+iv for which $u=e^x(x\cos y-y\sin y)$	**3**
2C.	(i) Find all possible expansion of $f(z)=\frac{z}{(z^2+5z+6)}$ about z = 0. (ii) Expand f(z) = z e^z about z = 1.	**4**
3A.	If f(z) = u + iv is analytic function of z , show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$	**3**

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3B.	Evaluate $\oint_C \frac{z^2+4}{(z^3+2z^2+z)}dz \quad where\ C:\lvert z\rvert=2.$	**3**
3C.	State and prove the Green's theorem .	**4**
4A.	Find the angle between the surfaces $xy^2z = 3x+z^2$ and $3x^2-y^2+2z=1$ at the point (1,-2,1).	**3**
4B.	Show that $\vec{F}=(2xz\cos y+y+2)i+(x-x^2z\sin y+z)j+(x^2\cos y+y+3)k$ is conservative. Find its scalar potential and find the work done by $\vec{F}$ in moving a particle in this force field from (1, 0, 2) to $\left(2,\ \frac{\pi}{2},\ 1\right)$.	**3**
4C.	Verify Stoke's theorem for $\vec{A}=(2x-y)\hat{i}-yz^2\hat{j}-y^2z\hat{k}$ where S is the upper half surface of the sphere $x^2+y^2+z^2=1$ and C is its boundary.	**4**
5A.	Solve $u_{xx}-2u_{xy}+u_{yy}=0$ using the transformations v = x, z = x + y .	**3**
5B.	Assuming the most general solution, solve the one dimensional wave equation $u_{tt}=c^2u_{xx}$ in a string of length π whose ends are fixed, starts vibration with zero initial velocity and the initial deflection is f(x) = 2sin2x-4sin3x, $0< x < \pi$.	**3**
5C.	Derive the one dimensional heat equation using Gauss divergence theorem.	**4**