Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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III SEMESTER B.TECH. (CHEMICAL/BIOTECH)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: ENGINEERING MATHEMATICS-III [MAT 2103]

REVISED CREDIT SYSTEM
(28/11/2016)

Time: 3 Hours MAX MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Find the Fourier series expansion of the function $f(x)=x-x^2$ in $(-\pi,\pi)$; $f(x+2\pi)=f(x)\forall x.$ Hence show that $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^2}=\frac{\pi^2}{12}$	**4**
1B.	Find the equation of the tangent plane and the normal line to the surface $x^2yz-4xyz^2=-6$ at the point $(1,2,1)$.	**3**
1C	Form the PDE by eliminating the arbitrary constants 'a' and 'b' $(x-a)^2+(y-b)^2=z^2\cot^2\alpha$, where ∝ is a parameter.	**3**
2A.	Verify Green's theorem in the plane for $\oint_C (x^2-xy^3)dx+(y^2-2xy)dy$,where C is a square with vertices $(0,0)(2,0),(0,2)\ and\ (2,2)$.	**4**
2B.	Obtain the half range cosine series expansion of the function $f(x)=x\sin x$ in $(0,\pi)$.	**3**
2C.	Find the analytic function $f=u+iv$, where $v=\log(x^2+y^2)+x-2y$	**3**

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3A.	Find the residues of the following functions at their singularities. i. $f(z)=\dfrac{1}{z^3(z+4)}$ ii. $f(z)=\dfrac{1}{e^{2z}z^2}$	**4**
3B.	Find the Fourier transform of the function $f(x)=\begin{cases} a-\lvert x\rvert & \lvert x\rvert<a \\ 0 & \lvert x\rvert>a \end{cases}$	**3**
3C.	Prove that $\boldsymbol{F}=(2xy+z^3)\boldsymbol{i}+x^2\boldsymbol{j}+3xz^2\boldsymbol{k}$ is conservative. Find its scalar potential.	**3**
4A.	Derive D'Alembert's solution of wave equation.	**4**
4B.	Solve $x^2\dfrac{\partial u}{\partial x}+y^2\dfrac{\partial u}{\partial y}=0$ using the method of separation of variables.	**3**
4C.	If $f(\alpha)=\int_C \dfrac{3z^2+7z+1}{z-\alpha}dz$, where $C:\lvert z\rvert=4$. Evaluate i. $f(3)$ ii. $f'(1-i)$ iii. $f''(1-i)$	**3**
5A.	Find all the possible expansions of $f(z)=\dfrac{1}{z^2-5z+6}$ with center z = 1.	**4**
5B.	Find $F_C\{e^{ax}\}$ and hence evaluate $F_c\{\dfrac{1}{1+x^2}\}$ and $F_s\{\dfrac{x}{1+x^2}\}$	**3**
5C.	Use Divergence theorem for $\vec{A}=2x^2y\hat{i}-y^2\hat{j}+4xz^2\hat{k}$ taken over the region in the first octant bounded by $y^2+z^2=9$ and $x=2$.	**3**