

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (CHEMICAL/BIOTECH) MAKEUP END SEMESTER EXAMINATIONS, DEC 2016

SUBJECT: ENGINEERING MATHEMATICS-III [MAT 2103]

REVISED CREDIT SYSTEM (30/12/2016)

Time: 3 Hours

MAX.

Instructions to Candidates:

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

1A.	Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2 & x < a \\ 0 & x > a \end{cases}$. Hence show that $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt = \frac{\pi}{4}$.	4							
1 B .	Find the constants a, b and c such that the directional derivative of $\phi = axy^2 + byz + cz^2x^3$ at the point (1,2,-1) has maximum magnitude of 64 in a direction parallel to z axis.								
1C.	Expand $f(x) = x^2$ as half range cosine series in (0,2). Also show the graphical extension	3							
2A.	Find the Fourier series expansion of the function $f(x) = \cos x _{\text{in}} (-\pi,\pi), f(x+2\pi) = f(x)$	4							
2B.	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							
2C.	Use the transformations $v = x$ and $z = x - y$ and solve $u_{xx} + 2u_{xy} + u_{yy} = 0$	3							
3A.	Derive the one dimensional wave equation by stating the appropriate physical assumptions	4							

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3B.	If $f(z) = u + iv$ is analytic function of z, show that $\left(\frac{\partial}{\partial x} f(z) \right)^2 + \left(\frac{\partial}{\partial y} f(z) \right)^2 = f'(z) ^2$										3		
3C.	Evaluate $\int_{C} \frac{z+4}{z^2+2z+5} dz$ where (i) C: $ z =1$ (ii) C: $ z+1-i =2$ c) C: $ z+1+i =2$											3	
4 A.	State Cauchy's residue theorem and use the same to evaluate $\oint_{c} \tan z dz$ $c: Z =2$												
4 B.	Prove that $\mathbf{A} = \mathbf{r}^n \mathbf{r}$ is conservative. Also find the scalar potential.												
4C.	Solve $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x+y)u$ by the method of separation of variables.												
5A.	Find all possible expansions of the function $f(z) = \frac{1}{z^3 - z}$ with center $z = 1$												
5B.	Find the Fourier cosine tran $F_s\{xe^{-a^2x^2}\}$	sform F _c {e	-a ² x ²	} ar	nd th	ne si	ne t	rans	sfor	n			
5C.	Evaluate $\oint_{S} F. nds$ where the entire region bounded by	F = 4xi - 1 y x ² + y ² =	2 <i>y</i> ² = 4,	j+ z=	<i>z² k</i> = 0	and and	dSi dZ	is th = 3	e su	ırfac	ce o	f	