

Mechanics (Practice for Advanced Mathematics)

Seat No.: _____ Enrolment No. _____
GUJARAT TECHNOLOGICAL UNIVERSITY
 SEMESTER-3 EXAMINATION - WINTER 2012
Subject code: 130002 Date: 09/01/2013
Subject Name: Advanced Engineering Mathematics
Time: 10:30 - 01:30 Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1	(a)	i	Solve $\frac{dy}{dx} + \frac{1}{x^2}y = 6e^{6x}$.	03
		ii	Solve $x^2y dx - (x^3 + xy^2)dy = 0$.	04
	(b)		Find the series solution of $(x^2 + 1)y'' + xy' - xy = 0$ near $x = 0$.	07
Q.2	(a)		Solve $2\frac{\partial u}{\partial x} = \frac{\partial u}{\partial t} + u$ subject to the condition $u(x,0) = 4e^{-3x}$.	07
	(b)		Find the series solution of $y'' = 2y'$ in powers of x .	07
			OR	
	(b)	i	Solve $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 12y = e^{4x}$.	03
		ii	Solve $(D^2 - 3D + 2)y = \frac{e^x}{1+e^x}$ by method of variation of parameters.	04
Q.3	(a)		Find the fourier series of $f(x) = \begin{cases} x^2 & (0, \pi) \\ 0 & (\pi, 2\pi) \end{cases}$.	07
	(b)		Find the half range cosine series for $f(x) = x, 0 < x < 3$.	07
			OR	
Q.3	(a)		Find fourier series of $f(x) = x^2 + x$ where $-2 < x < 2$.	07
	(b)		Find fourier series of $f(x) = \begin{cases} x, & -1 < x < 0 \\ 2, & 0 < x < 1 \end{cases}$.	07
Q.4	(a)		Prove that $L(1) = \frac{1}{s}$ and $L(\sin at) = \frac{a}{s^2 + a^2}$.	07
	(b)		Evaluate	
	(i)		$L^{-1}\left\{\frac{6s}{s^2 - 16}\right\}$	03
	(ii)		$L^{-1}\left\{\frac{10}{(s-2)^2}\right\}$	04
			OR	
Q.4	(a)		Solve by Laplace transform $y'' + 6y = 1, y(0) = 2, y'(0) = 0$.	07
	(b)		If $L\{f(t)\} = \bar{f}(s)$ and if $L\left\{\frac{f(t)}{t}\right\}$ exists then prove that $L\left\{\frac{f(t)}{t}\right\} = \int_s^\infty \bar{f}(s) ds$. Also find $L\left\{\frac{\sin 2t}{t}\right\}$.	07

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