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VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.: 24BEC0345

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2024-2025

SLOT: A1+TA1+TAA1

Programme Name & Branch : B Tech
Course Code and Course Name : BMAT102L-Differential Equations and Transforms
Faculty Name(s) : Common
Class Number(s) :
Date of Examination : 27.01.2025
Exam Duration : 90 minutes

Maximum Marks: 50

General instruction(s): Answer All Questions

Q. No	Question	M	CO	BL
1.	Solve $(D^2 - 3D + 2)y = \frac{1}{1+e^{-x}}$; using the method of variation of parameters where $D: \frac{d}{dx}$	10	1	2
2.	Solve $y'' - 4y' - 12y = 3e^{5t}$ with $y(0) = \frac{18}{7}$, $y'(0) = -\frac{1}{7}$ using the method of undetermined coefficients.	10	1	2
3.	A circuit has in series and an electromotive force given by $\cos t$, resistor of 3 ohms, inductor of 1 henry and capacitor of 0.5 farads, if initial current and charge on capacitor is zero. Find the charge on capacitor at any time $t > 0$.	10	1	3
4.	(i) Find the partial differential equation of all spheres whose centres lie on the z-axis. (5M) (ii) Solve the partial differential equation $(x+2z)p + (4zx-y)q = 2x^2 + y$, using Lagrange's method of multipliers. (5M)	10	2	2
5.	Solve the equation $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$; with $u(x,0) = 4e^{-x}$ using method of separation of variables.	10	2	2

$2x^2 - 4xz$
 $4xz - y$
 $2x^2 + y$
 $2x^2 + y + z = 0$
 $x^2 + y + z$
 $x^2 + 2zx$
 $-2zx - \frac{y}{2}$
 $-x^2 - \frac{y}{2}$
 $x dx - \frac{1}{2} dy - \frac{1}{2} dz$
 $\frac{x^2}{2} - \frac{y}{2} - \frac{z}{2}$

$\frac{dx}{(x+2z)} = \frac{dy}{(4zx-y)} = \frac{dz}{2x^2+y}$
***** Cost.
 $(2x, 1, 1)$ $(x, \frac{-1}{2}, \frac{-1}{2})$
 $\sqrt{a^2 - x^2}$
 $(LD^2 + RD + \frac{1}{C})z = \cos t$
 $x^2 + y^2 + (z-a)^2 = r^2$
 $2x + 0 + 2(z-a)p = 0$
 $2y + 0 + 2(z-a)q = 0$