

Subject Code: BSM-160

Roll No 

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B. Tech  
First Year Second Semester  
MINOR TEST (EXAMINATION): 2025-26  
ENGINEERING MATHEMATICS-II

Time: 2 Hr.

Max. Marks: 30

Note: Answer all questions.

		Marks	CO	BL	PO	PI Code
Q1.	Attempt any Three parts of the following.					
a)	Solve: $(D^2 - 3D + 2)y = e^x \cos\left(\frac{x}{2}\right) + 2^x$	4	1	3	1,2	1.1.1
b)	Solve $(x^2 D^2 + xD - 1)y = \frac{x^3}{1+x^2}$	4	1	3	1,2	1.1.2
c)	Find the series solution about origin of the differential equation $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} - 4y = 0.$	4	2	3	1,2	1.1.2
d)	Explain ordinary point, singular point and types of singular points of a second order differential equation with the suitable examples. Also, find the series solution of the following differential equation $\frac{d^2 y}{dx^2} + xy = 0$	4	2	2		1.1.3
Q2.	Attempt any Three parts of the following.					
a)	Solve the differential equation by changing independent variable $x \frac{d^2 y}{dx^2} - \frac{dy}{dx} - 4x^3 y = 8x^3 \sin(x^2)$	3	1	3	1,2	1.1.1
b)	By the method of variation of parameter, solve the differential equation $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + y = e^x \log x.$	3	1	2,3	1,2	1.1.2
c)	Solve the simultaneous equation $2 \frac{dx}{dt} - \frac{dy}{dt} + 2x + y = 11t,$ $2 \frac{dx}{dt} + 3 \frac{dy}{dt} + 5x - 3y = 2$	3	1	2,3	1,2	1.1.2
d)	Solve the following differential equation $\frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + (4x^2 - 1)y = -3e^{x^2} \sin 2x$	3	1	2,3	2	1.1.3
Q3.	Attempt any Three parts of the following.					
a)	Prove that: (i) $x J_n'(x) = n J_n(x) - x J_{n+1}(x)$ (ii) Express $J_{1/2}(x)$ , $J_{-1/2}(x)$ in terms of sine and cosine functions.	3	2	2,3	1,2	1.1.2
b)	(i) Express $4x^3 + 6x^2 + 7x + 2$ in terms of Legendre's polynomials. (ii) Show that $n P_n(x) = x P_n'(x) - P_{n-1}'(x)$	3	2	2	1,2	1.1.2
c)	(i) If $J_n(x)$ is the Bessel's function of first kind of order n, then show that $2n J_n = x(J_{n-1} + J_{n+1})$ (ii) Show that $\int_0^{\pi/2} \sqrt{\pi x} J_{1/2}(2x) dx = 1$	3	2	2	2	1.1.2
d)	State and prove Rodrigue's Formula.	3	2	3	1,2	1.1.3