



Roll No:

B.TECH.
(SEM. II) THEORY EXAMINATION 2025-26
ENGINEERING MATHEMATICS-II

TIME: 3 HRS**M.MARKS: 70****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****02 x 7 = 14**

Q no.	Question	CO	Level
a.	Solve the following differential equation $\frac{d^2\theta}{dt^2} + g\theta = 0$, g being constant.	CO-1	K1
b.	Determine the Laplace transform of $f(t) = \begin{cases} e^{-t}, 0 < t < 3 \\ 0, t > 3 \end{cases}$.	CO-2	K2
c.	Determine the value of b_n if $f(x) = 1, 0 \leq x \leq 2$ is expanded as $f(x) = \sum_{n=1}^{\infty} b_n \sin \frac{n\pi x}{2}$.	CO-3	K1
d.	Determine the value of $n (\neq 0)$ for which $u = (x^2 + y^2)^{n/2}$ is harmonic.	CO-4	K2
e.	Determine the pole of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$	CO-5	K2
f.	Determine the particular integral of $\frac{d^2y}{dx^2} - \frac{dy}{dx} = e^x + e^{-x}$.	CO-1	K1
g.	Determine the function whose Laplace transform is $F(s) = \frac{1}{s^2 - 4s + 8}$.	CO-2	K1

SECTION B**2. Attempt any three of the following:****07 x 3 = 21**

Q no.	Question	CO	Level
a.	Apply method of variation of parameters to determine the general solution of $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = x^3 + x$	CO-1	K3
b.	Apply Laplace transform method to solve $\frac{d^2y}{dt^2} - 3 \frac{dy}{dt} + 2y = 4t + e^{3t}$, $y(0) = 1, y'(0) = -1$	CO-2	K3
c.	Determine the Fourier series expansion of the following function $f(x) = 1 + x, -1 < x < 1, f(x+2) = f(x)$. Hence compute the sum of the series $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$	CO-3	K3
d.	Prove that for the function $f(z) = \frac{\bar{z}^2}{z}, z \neq 0; f(0) = 0$, Cauchy-Riemann equations are satisfied at the origin. Does $f'(z)$ exist there?	CO-4	K3
e.	Use Cauchy integral formula to evaluate $\oint \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where c is the circle $ z = 3$	CO-5	K3



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SECTION C

3. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Solve $(D^2 - 2D + 4)y = \sin 2x$, given that $y = 1/8, y' = 4$, when $x = 0$. Find the value of y when $x = \pi/4$.	CO-1	K3
b.	Solve the following differential equation $\frac{d^2y}{dx^2} - \frac{1}{x} \frac{dy}{dx} + 4x^2y = x^4$ by changing the independent variable.	CO-1	K3

4. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Apply convolution theorem to evaluate: $L^{-1} \left\{ \frac{s}{(s^2+4)^2} \right\}$	CO-2	K3
b.	Determine the Laplace transform of the following functions $f(t) = \begin{cases} 0, & 0 < t < a \\ 1, & a < t < 2a \\ 2, & 2a < t < 3a \end{cases}$ and $f(t+3a) = f(t)$	CO-2	K3

5. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Test for convergence the series $\frac{x}{1*2} + \frac{x^2}{2*3} + \frac{x^3}{3*4} + \frac{x^4}{4*5} + \dots$	CO-3	K3
b.	(i) Given the function $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \end{cases}$. Expand $f(x)$ as a series of cosines. (ii) Test the convergence of the series $1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^4} + \dots$	CO-3	K3

6. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	If $u + v = (x + y)(2 - 4xy + x^2 + y^2)$, find $f(z) = u + iv$ in terms of z .	CO-4	K3
b.	Find the Bilinear transformation which maps the points $z = 0, -1, i$ into $w = i, 0, \infty$. Also find the image of the unit circle $ z = 1$.	CO-4	K3

7. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Apply the method contour integration to evaluate the integral $\int_0^{2\pi} \frac{1}{3 - 2\cos\theta + \sin\theta} d\theta$,	CO-5	K3
b.	Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for (i) $1 < z < 3$ (ii) $ z > 3$ (iii) $0 < z+1 < 2$ (iv) $ z < 1$	CO-5	K3