



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:ETC	Pattern:2022
Name of Course:Applied Mathematics-III	Course Code:SMH222401
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome of the Question/sub-question.
6. Use of non-programmable scientific calculator is allowed

Marks CO

Question No. 1

- 1a) An inductor of 0.25 henries is connected in series with negligible resistance and a capacitor of 0.04 farads, a generator having alternative voltage given by $12\sin 10t$ ($t > 0$). Find charge and current if the differential equation is given by $L\left(\frac{d^2q}{dt^2}\right) + \frac{q}{C} = E$. (6) CO4

Question No. 2

- 2a) The electric flux density in free space is given by $\vec{D} = xy^2z^3\vec{i} + 2xyz^3\vec{j} + 3xy^2z^2\vec{k}$ find the total electric flux passing through the surface $0 \leq x \leq 3$, $0 \leq y \leq 2$, $z = 4$ in the direction away from the origin. (6) CO4

Question No. 3

- 3a) Find Laplace transform of $e^{-2t} \int_0^t \frac{\sin 5t}{t} dt$. (5) CO2

OR

- 3b) Find Laplace transform of $t^2 \cos 2t$. (5) CO2

- 3c) Find inverse Laplace transform of $\frac{3s+7}{s^2-2s-3}$ by using partial fraction. (5) CO2

OR

- 3d) Find inverse Laplace transform of $\frac{5}{(s-3)^2(s+2)}$ by using Convolution theorem. (5) CO2

- 3e) Solve by Laplace transform method, (6) CO4

$$y'' - 2y' - 24y = 0; \quad y(0) = y'(0) = 1.$$

OR

- 3f) Solve by Laplace transform method, (6) CO4

$$y'' - y' = 5; \quad y(0) = y'(0) = 0.$$

Question No. 4

- 4a) Find the Fourier sine Transform of, (5) CO2

$$f(x) = \begin{cases} \sin x, & 0 \leq x \leq a \\ 0, & x > a \end{cases}$$

OR

- 4b) Find the Fourier transform of, (5) CO2

$$f(x) = \begin{cases} 1 - x^2, & -1 \leq x \leq 1 \\ 0, & |x| > 1 \end{cases}$$

- 4c) Find the Fourier cosine integral representation of the function $f(x) = \frac{\pi}{3}e^{-3x}, \quad x > 0.$ (5) CO3

OR

- 4d) Find the Fourier sine integral representation of the function (5) CO3

$$f(x) = \begin{cases} 1 - x, & -2 \leq x \leq 2 \\ 0, & |x| > 2 \end{cases}$$

- 4e) Obtain the Fourier series to represent $f(x) = \frac{\pi^2 - x^2}{4}$ in the interval $-\pi \leq x \leq \pi.$ (6) CO4

OR

- 4f) Obtain the Fourier series to represent $f(x) = e^{2x}$ in the interval $0 \leq x \leq 2\pi.$ (6) CO4

Question No. 5

- 5a) Find the Z-transform of $f(k) = (k+1)^2 2^k, \quad k \geq 0.$ (5) CO2

OR

- 5b) Find the Z-transform of $f(k) = 3^k \cos\left(\frac{k\pi}{2} + \alpha\right), \quad k \geq 0, \quad \alpha \text{ is constant.}$ (5) CO2

- 5c) Find the inverse Z-transform of $\frac{z}{\left(z - \frac{1}{3}\right)\left(z + \frac{1}{3}\right)}$ using integral inversion method. (5) CO3

OR

- 5d) Find the inverse Z-transform of $\frac{z^2 + 2z}{z^2 - 3z + 2}; \quad 1 < |z| < 2$ using partial fraction method. (5) CO3

- 5e) Solve the difference equation, (6) CO4

$$f(k+2) + 3f(k+1) + 2f(k) = 0; \quad f(0) = 0, \quad f(1) = 1.$$

OR

- 5f) Solve the difference equation, (6) CO4

$$f(k+1) + \frac{1}{5}f(k) = \left(\frac{1}{5}\right)^k; \quad f(0) = 0, \quad k \geq 0$$

..... End of question paper.....