AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD
DEPARTMENT OF APPLIED SCIENCES & HUMANITIES

Sessional Test 2

Program: B.Tech | **Semester: 2**
Session: 2024-25 | **Section: All Section excluding S-10**
Subject: Engineering Mathematics-II | **Subject Code: BAS-203**
Max. Marks: 50 | **Time: 2 Hours**

OBE Remarks:

Q.No	1	2	3	4	5	6	7	8	9	10	11	12
CO No.	CO2	CO2	CO3	CO3	CO3	CO2	CO2	CO2	CO3	CO3	CO2	CO3
Bloom's Level* (L1 to L6)	L1	L2	L3	L1	L2	L5	L5	L3	L6	L6	L3	L6
Weightage CO2: 26.5						Weightage CO3: 23.5						

**Bloom's Level: L1: Remember, L2: Understand, L3: Apply, L4: Analyze, L5: Evaluate, L6: Create*

Note: Answer **all** the sections with all the questions

Section-A (2*5=10)

1. Find Laplace transform of $F(t) = \sinh at \sin bt$.
2. State unit step function and find its Laplace transform.
3. Find the Fourier constant b_1 for the function $f(x) = \left(\frac{\pi - x}{2}\right)$ in the interval $(0, 2\pi)$
4. State Dirichlet's conditions for the expansion of $f(x)$ in Fourier series.
5. What is the Fourier series for an even function defined in the interval $(-l, l)$.

Section-B (5*5=25)

6. Find Laplace transform of $t^2 e^t \sin 4t$.
7. Use convolution theorem to find $L^{-1}\left(\frac{s}{(s^2+4)(s^2+1)}\right)$.
8. Find the inverse Laplace transformation of $\log\left\{\frac{s^2+1}{s(s+1)}\right\}$.
9. Find the half range cosine series of the function $f(t) = \begin{cases} 2t, & 0 < t < 1; \\ 2(2-t), & 1 < t < 2. \end{cases}$
10. Obtain the Fourier series for the function $f(x) = \begin{cases} x, & -\pi < x < 0 \\ -x, & 0 < x < \pi \end{cases}$ and hence, show that

(i) $1 - \frac{1}{4} + \frac{1}{9} - \frac{1}{16} + \cdots = \frac{\pi^2}{12}$. (ii) $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$.

Section-C (7.5*2=15)

11. Solve the Simultaneous equation by using Laplace transfom

$$\frac{dx}{dt} + \frac{dy}{dt} + x + y = 1, \frac{dy}{dt} = 2x + y; x(0) = 0, y(0) = 1.$$

12. If $f(x) = \begin{cases} 0, & -\pi \le x \le 0 \\ \sin x, & 0 \le x \le \pi \end{cases}$, Prove that $f(x) = \frac{1}{\pi} + \frac{1}{2}\sin x - \frac{2}{\pi}\sum_{n=1}^{\infty} \frac{\cos 2nx}{4n^2 - 1}$. Hence show that

$$\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \ldots\ldots = \frac{\pi - 2}{4}.$$

HOD Sign.

Faculty Sign.