

Roll No.


**PRESIDENCY
UNIVERSITY**
BENGALURU
School of Computer Science and Engineering
Mid - Term Examinations – November 2024

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|---|--------------------------------|
| Semester: III | Date: 4-11-2024 |
| Course Code: MAT1002 | Time: 11:45am – 01:15pm |
| Course Name: Transform Techniques, Partial Differential Equations and Their Applications | Max Marks: 50 |
| Program: B.Tech | Weightage: 25% |

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Do not write anything on the question paper other than roll number.
Part A
Answer ALL the Questions. Each question carries 2marks.
2Mx5Q=10M

1. Define Periodic Function with example. 2 Marks L1 CO1
2. Show whether the function $f(x) = x^4$ is even or odd function 2 Marks L1 CO1
3. Find the Laplace transform of $e^{2t} + 4t^3 - 2\sin 3t$. 2 Marks L1 CO2
4. Find the Laplace transform of $f'(t)$, where $f(t) = \sin(4t)$. 2 Marks L1 CO2
5. Find the inverse Laplace transform of $\frac{2}{s+3} + \frac{5s}{s^2+9}$ 2 Marks L1 CO2

Part B
Answer ALL Questions. Each question carries 10 marks.
4QX10M=40M

6. Construct the Fourier series for the function $f(x) = x^2$, $0 < x < 2\pi$. 10 Marks L3 CO1

OR

7. Construct the Fourier series of the function $f(x) = \begin{cases} 2, & -2 < x < 0 \\ x, & 0 < x < 2 \end{cases}$ 10 Marks L3 CO1

8a Construct the half range cosine series of 5 Marks L3 C01

$$f(x) = \begin{cases} x & 0 < x < 1 \\ 2 - x & 1 < x < 2 \end{cases}$$

8. **8b** Construct the Fourier sine series for the function $f(x) = e^{ax}$ for 5 Marks L3 C01
 $0 < x < \pi$, where a is constant

OR

Develop the Fourier series of $f(x)$ defined in the interval $(0, 2\pi)$ by 10 Marks L3 C01
means of the table of values given below. Find the series up to the
second harmonics.

9.

| | | | | | | | |
|--------|-----|-----------------|------------------|-------|------------------|------------------|--------|
| x | 0 | $\frac{\pi}{3}$ | $\frac{2\pi}{3}$ | π | $\frac{4\pi}{3}$ | $\frac{5\pi}{3}$ | 2π |
| $f(x)$ | 1.0 | 1.4 | 1.9 | 1.7 | 1.5 | 1.2 | 1.0 |

10a Construct the Laplace transform of $t e^{-t} \sin 3t$. 5 Marks L3 C02

10. **10b** Construct the Laplace transform of $\frac{\cos(at) - \cos(bt)}{t}$ 5 Marks L3 C02

OR

11. Develop the function $f(t) = \begin{cases} t^2, & 0 < t < 2 \\ 4t, & 2 < t \leq 4 \\ 8, & t > 4 \end{cases}$ in terms of 10 Marks L3 C02
unit step function and hence find their Laplace transform.

12a Construct the inverse Laplace transform of $\frac{s}{s^2 + 4s + 5}$ 5 Marks L3 C02

12. **12b** Construct the inverse Laplace transform of $\log\left(\frac{s+1}{s-1}\right)$ 5 Marks L3 C02

OR

13a Find the Inverse Laplace transform of $\frac{3s^2 + 4}{s^5}$ 2 Marks L1 C02

13. **13b** Construct the inverse Laplace transform of $\frac{4s + 5}{(s + 2)(s - 1)^2}$ 8 Marks L3 C02