

University of Calicut
Model Question Paper, Fourth Semester B.Sc Degree Examination
CCSS Programme
Mathematics Complementary Course
MM 4C 04 - Mathematics

Time 3 hours

(Maximum weightage 30)

Objective Type Questions

(Answer all questions from 1 to 12, weightage 1/4 each , (12 × $\frac{1}{4}$ = 3))

1. The Laplace transform of $2t$ is _____
2. The inverse Laplace transform of $\frac{1}{(s+1)^2}$ is _____
3. Convolution of $f(t)$ and $g(t)$ is defined by _____
4. The relation between the Laplace transform of f and that of f' is _____ .
5. _____ is an example of an Euler-Cauchy equation .
6. An example of a periodic function is _____
7. An example of an odd function is _____ .
8. _____ is an example of a function which is neither even nor odd.
9. _____ is a one dimensional wave equation.
10. _____ is a two dimensional Laplace equation .
11. Wronskian of 1 and e^x is _____ .
12. $(D-1)(D+2)e^{2x} =$ _____ .

Short Answer Type Questions. (Answer all questions(13-21), weightage 1 each
(9 × 1 = 9).

13. What do you mean by a solution of a differential equation.
14. Solve the differential equation $y'' - 8y = 0$.
15. Find a general solution of the differential equation $(D^2 - D - 2)y = 0$ using factorization.
16. State the First Shifting Theorem.
17. Find the Laplace transform of te^{-3t} .

18. Find the inverse Laplace transform of $\frac{3}{s^2 + 6s + 18}$.

19. Find the inverse Laplace transform of $\frac{1}{(s - 3)^3}$.

20. Find $e^t * e^{-t}$.

21. Solve the partial differential equation $u_y = u$

(Short Essay or Paragraph Questions: Answer any 5 questions from 7 (22-28), weightage 2 each. ($5 \times 2 = 10$))

22. Solve the boundary value problem : $3y'' + 8y' - 3y = 0, y(-3) = 1, y(3) = \frac{1}{e^2}$.

23. Find the general solution of the differential equation $y'' + 2y' - 35y = 12e^{5x} + 37 \sin 5x$.

24. Find the general solution of the differential equation $y'' - 2y' + y = \frac{e^x}{x^3}$.

25. Find the Fourier series of the function $f(x) = x(-\pi < x < \pi)$, which has the period 2π .

26. Find the Fourier cosine series of the function $f(x) = 1(0 < x < L)$.

27. Using Laplace transform solve the differential equation $y'' + 2y' + 2y = r(t), r(t) = 5u(t - 2\pi) \sin t, y(0) = 0, y'(0) = 0$.

28. Apply Picards iteration to the problem $y' = x + y, y(0) = 0$

(Essay Questions : Answer any 2 questions from 3 (29- 31)($2 \times 4 = 8$ weightage)

29. Find the Fourier series of the function $f(x) = x^3(-\pi < x < \pi)$, which has the period 2π .

30. Solve $y' = -0.2xy, y(0) = 1$ by the classical Runge-Kutta Method (2 steps, $h = 0.2$)

31. Find the approximate value of the integral $\int_1^2 \sqrt{\frac{x^2 - 1}{x}} dx$ by considering four ordinates by Simpson's Rule.