18U405 (Pages: 2) Name: ……

Reg. No……..

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2020

(CUCBCSS - UG)

(Regular/Supplementary/Improvement)

CC15U MAT4 C04 – MATHEMATICS IV

(Mathematics - Complementary Course)

(2015 Admission onwards)

Time: Three Hours Maximum: 80 Marks

PART A

Answer ***all*** questions. Each question carries 1 mark.

1. Solve the differential equation $y'' + y = \sec x$
2. Solve $(D+3)(D+6)y = 0$.
3. Define Wronskian of two solutions y_1 and y_2.
4. Find $\mathcal{L}[t]$.
5. State first shifting theorem of Laplace transform.
6. Find $\mathcal{L}^{-1}\left(\frac{1}{(s-a)}\right)$
7. Give an example of a function which is neither even nor odd.
8. The fundamental period of $\sin x$ is ……
9. The value of the Fourier coefficient a_n for an odd function is ……
10. Write the error estimate of Trapezoidal rule.
11. The formula for $\frac{1}{3}$ -rd Simpson's rule is ……
12. What is Rectangular rule of Integration?

(12 x 1 = 12 Marks)

PART B

Answer any ***nine*** questions. Each question carries 2 marks.

13. Solve $y'' - 2y' - 2y = 0,\ y(0) = 4,\ y'(0) = 1.$
14. Find a differential equation $y'' + ay' + by = 0$ with basis e^{-x}, e^{-2x}
15. Solve the differential equation $y'' + y = \sec x$
16. Write $g(t) = \begin{cases} 1, & 0 < t < \pi \\ 0, & \pi < t < 2\pi \\ \sin t, & t > 2\pi \end{cases}$ in terms of unit step function.
17. Find $\mathcal{L}[\cosh t]$ using linearity theorem.
18. Find the inverse Laplace transform of $\frac{2}{s^4}$
19. Give an extension to $(-1, 1)$ for f(x) = x defined in $(0, 1)$

20. Describe Picard's Iteration method.
21. Define Fourier cosine series.
22. Check whether the function $f(x) = x|x|$ is odd or even.
23. Solve $u_{xx} = u$, where u is a function of two variables x and y
24. Use Euler's method to solve $y' = 1 - y$, $y(0) = 0$ at the point $x = 0.2$ with $h = 0.1$

(9 x 2 = 18 Marks)

PART C

Answer any ***six*** questions. Each question carries 5 marks.

25. Find a particular solution for $y'' - 3y' - 4y = -8e^t cos\ 2t$
26. Solve the non homogenous equation $y'' - y' - 2y = 10cos\ x$
27. Find $\mathcal{L}^{-1}\left(\frac{4}{(s+1)(s+2)}\right)$
28. Solve the initial value problem $y'' + 4y' + 3y = 0, y(0) = 3, y'(0) = 1$ using Laplace transform.
29. If $f(t) = t\ sin\ at$, find $\mathcal{L}[f(t)]$
30. Using convolution property, find $\mathcal{L}^{-1}\left(\frac{1}{s^2(s-a)}\right)$
31. Expand $f(x) = cos\ x$ in the half range sine series in $0 \leq x < \pi$.
32. Show that the function $u = x^2 - y^2$ is a solution of the two dimensional Laplace equation.
33. Estimate the integral $\int_1^2 xdx$ using trapezoidal rule taking $h = 0.2$

(6 x 5 = 30 Marks)

PART D

Answer any ***two*** questions. Each question carries 10 marks.

34. Solve the non homogenous equation $y'' - 4y' + 3y = sin\ 3x\ cos\ 2x$
35. Find the Fourier series of $f(x) = \begin{cases} 1, & -\pi < x < 0 \\ -1, & 0 < x < \pi \end{cases}$
36. Use Runge-Kutta method to find $y(0.2)$ by solving $y' = x^2 + y^2$, $y(0) = 0$ with $h = 0.1$

(2 x 10 = 20 Marks)

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