

Code No: 7HC16

Date: 14-August-2024 (T.N)

B.Tech II-Year II- Semester External Examination, August - 2024 (Supplementary)

MATHEMATICS-II (DIFFERENTIAL CALCULUS) (CSE,IT,ECM)

Time: 3 Hours

Max.Marks:70

Note: a) No additional answer sheets will be provided.
b) All sub-parts of a question must be answered at one place only, otherwise it will not be valued.
c) Missing data can be assumed suitably.

Bloom's Cognitive Levels of Learning (BCLL)

Remember	L1	Apply	L3	Evaluate	L5
Understand	L2	Analyze	L4	Create	L6

Part - A
ANSWER ALL QUESTIONS

Max.Marks:20

	BCLL	CO(s)	Marks
1 Define functional dependence	L1	CO1	[2M]
2 Write Bernoulli's Equation.	L2	CO2	[2M]
3 Find Particular Integral $(D^2 + 4)y = \sin 2x$	L2	CO3	[2M]
4 Write Lagrange's interpolation formula.	L1	CO4	[2M]
5 Write Picard's formula.	L1	CO5	[2M]
6 Find $L^{-1}\left(\frac{7s-15}{s^2+4}\right)$	L2	CO6	[2M]
7 Define Jacobian two variables' formulae.	L1	CO1	[2M]
8 Write Cauchy-Euler equation	L1	CO3	[2M]
9 Find $L(e^{3t} + \cos 5t - 100 + t^6)$	L1	CO6	[2M]
10 Write Newton -Raphson formula.	L1	CO5	[2M]

Part - B
ANSWER ANY FIVE QUESTIONS. EACH QUESTION CARRIES 10 MARKS.

Max.Marks:50

	BCLL	CO(s)	Marks
11. a) Show that $u = x + y + z, v = xy + yz + zx, w = x^2 + y^2 + z^2$ are functionally dependent and hence find the relation between them.	L3	CO1	[5M]
b) A rectangular box open at the top is to have volume of 32 cubic feet. Find the dimensions of the box requiring least material for its construction.	L5	CO1	[5M]
12. a) Solve $(1 + e^{x/y})dx + (1 - \frac{x}{y})e^{x/y}dy = 0$	L3	CO2	[5M]
b) A body is originally at 80°C and cools down to 60°C in 20 minutes. If the temperature of the air is 40°C , find the temperature of the body after 40 minutes.	L5	CO2	[5M]
13. a) Solve the differential equation $(D^2 - 5D + 6)y = e^x \sin x$	L3	CO3	[5M]
b) Solve $(D^2 + 4)y = \tan 2x$ by the method of variation of parameters	L4	CO3	[5M]
14. a) Find root of the equation $f(x) = e^x - 3x$ using Newton Raphson method that lies between 0 and 1.	L4	CO4	[5M]
b) Find the polynomial $f(x)$ by using Lagrange's formulae and hence find	L2	CO4	[5M]

$f(3)$

x:	0	1	2	3
y:	2	3	12	147

15. a) Using Taylor's series method, find an approximate value of y at x=0.2 for the differential equation $y' - 2y = 3e^x$ for y (0) = 0. L4 CO5 [5M]
- b) Find y (0.1) using Runge-Kutta fourth order formula , given that $y' = x + x^2 y$ and y (0) =1 L4 CO5 [5M]
16. a) Find $L^{-1} \left\{ \frac{1}{s(s+2)^3} \right\}$ L3 CO6 [5M]
- b) State Convolution theorem on Laplace Transform and hence find the Inverse Laplace Transform of $\frac{1}{s(s^2+a^2)}$ L3 CO6 [5M]
17. a) If $u = \log \left(\frac{x^2+y^2}{x+y} \right)$, prove that $x^{u_x} + y^{u_y} = 1$ L3 CO1 [4M]
- b) Solve $x \frac{dy}{dx} + y = \log x$ L2 CO2 [3M]
- c) Solve $(D^3 + 1)y = \cos 2x$ L2 CO3 [3M]
18. a) If $x^3 - x - 4 = 0$, then by Bisection method find first two approximations x_0 and x_1 L5 CO4 [4M]
- b) If $\frac{dy}{dx} = x - y$, y (0) = 1 find y (0.1) by Euler's method. L5 CO5 [3M]
- c) Find the Laplace Transform of $\left(\frac{\sin t}{t} \right)$ L5 CO6 [3M]

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