Carmel College Arts Science and Commerce for Women
Semester End Examination August 2020

Semester: VI **Subject: Mathematics**

Paper name and code: Differential equations II (MTC108)

Duration : 2hrs **Date:10/08/2020** **Total marks: 30**

Instructions:

1. *All questions are compulsory, however internal choice is available.*
2. Figures to the right indicate maximum marks allotted to the question.
3. Student shall write down the answers and should sign each and every page with date and then upload the scanned copy/photograph of the answer sheet in PDF format.
A student must upload their answer scripts by 2.00 pm.
4. PDF should be titled as : Name of the student, Seat Number and paper name

I) Answer <u>any five</u> of the following questions. (5x2mks=10mks)

1. Apply Runge Kutta method of second order to find the numerical solution of the initial value problem $\frac{dy}{dx} = x + y$ at x = 0.1; where y(0)=1 with h=0.05.
2. Find the Laplace transform; $L(e^{-t}cos3t)$
3. Find $L^{-1}\left(\frac{s}{s(s^2+4)}\right)$ where L^{-1} denotes inverse Laplace transform.
4. Use Euler Method to find the solution of the differential equation $\frac{dy}{dx} = x + y$ at x= 0.1 given that y(0)=1.
5. Express $f(x) = 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomial
6. Solve the differential equation $(r + \sin\theta - \cos\theta)dr + r(\sin\theta + \cos\theta)d\theta = 0$
7. Solve $\frac{dy}{dx} = \sec(x + y)$
8. Show that x= 0 is a regular singular point of $x^2y'' + xy + \left(x^2 - \frac{1}{4}\right)y = 0$

II) Answer <u>any four</u> of the following questions. (4x5mks=20mks)

1. Find the indicial equation and the exponents of the differential equation $x^2y'' + 4xy' + (1 - x^2)y = 0$
2. Use Milne's Predictor corrector method to obtain the solution of the equation $\frac{dy}{dx} = x^2(1 + y)$ at x = 1.4 given that y (1) = 1, y (1.1) = 1.233 , y(1.2)= 1.545 , y(1.3)= 1.979
3. Use Laplace transform to solve $y'' - y' - 6y = 2$ where y(0)=1 and y'(0)=0
4. Find $L^{-1}\left(\frac{s}{(3s+1)(s-1)^2}\right)$ where L^{-1} denotes inverse Laplace transform.
5. Use D operator method to solve $(D^2 - 1)y = Coshx\ cosx$

********************* *The End* ***********************