B.Sc. DEGREE END SEMESTER EXAMINATION OCTOBER/NOVEMBER 2018

SEMESTER –5: MATHEMATICS (CORE COURSE FOR MATHEMATICS AND COMPUTER APPLICATIONS)

COURSE: **15U5CRMAT6-15U5CRCMT6: DIFFERENTIAL EQUATIONS**

(Common for Regular 2016 admission & Supplementary 2015 & 2014 admissions)

Time: Three Hours   Max. Marks: 75

PART A

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

1. Write the necessary and sufficient condition for the differential equation
   $M(x, y)dx + N(x, y)dy = 0$ to be exact.

2. Define Bernoulli's equation.

3. Reduce $\dfrac{dy}{dx} + \dfrac{x}{1-x^2}\, y = x\sqrt{y}$ to linear form.

4. Solve $\dfrac{d^4 y}{dx^4} - 5\dfrac{d^2 y}{dx^2} - 4y = 0$

5. Form a linear second order homogenous differential equation whose solution is
   $y = c_1 e^{-2x} + c_2 e^{3x}$

6. Find the wronskian of the functions $\{Cos\, 2x, Sin\, 2x\}$

7. Define singular point and ordinary point.

8. Explain Bessel function of the first kind of order n.

9. What is the auxiliary equation of Lagrange's linear partial differential equation?

10. Form a Partial differential equation from the equation $z = (x^2 + a^2)(y^2 + b^2)$ by eliminating the
    arbitrary constants.   (1 x 10 = 10)

PART B

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

11. Solve $x\dfrac{dy}{dx} + y = x^3 y^6$

12. Find the integrating factor of $\left(x^2 y - 2xy^2\right)dx - \left(x^3 - 3x^2 y\right)dy = 0$

13. Find the orthogonal trajectories of the hyperbolas $xy = c$.

14. Convert the equation $x^3 \dfrac{d^3 y}{dx^3} + 2x^2 \dfrac{d^2 y}{dx^2} + 2y = 0$ in to ordinary differential equation with
    constant co efficient.

15. Find the particular integral of the equation $\dfrac{d^2 y}{dx^2} + 4y = \cos 2x$

16. Solve $\dfrac{d^3 y}{dx^3} - 7\dfrac{dy}{dx} - 6y = 0$

17. Prove that $J_1(0) = 0$

18. Find the singular point of $(x^3 + x^2)y'' + (x^2 - 2x)y' + 4y = 0$

19. Verify that $z = f(x^2 + y^2)$ is a solution of $y\dfrac{\partial z}{\partial x} - x\dfrac{\partial z}{\partial y} = 0$

20. Solve the equation $xp + yq = 3z$ (2 x 8 = 16)

PART C

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

21. Solve $x\log x\dfrac{dy}{dx} + y = 2\log x$

22. Solve the exact equation $(y\cos x + 1)dx + \sin x dy = 0$

23. Reduce to first order $x^2 y'' - xy' + y = 0$ and solve if $y = x$ is one of its solution.

24. Solve by the method of undetermined coefficients $y'' - 6y' + 8y = 3e^{2x}$

25. Find the power series solution of $2x^2\dfrac{d^2 y}{dx^2} + (2x^2 - x)\dfrac{dy}{dx} + y = 0$

26. Prove that $J_{1/2}(x) = \sqrt{\dfrac{2}{\pi x}}\sin x$

27. Solve $(z - y)p + (x - z)q = y - x$ (5 x 5 = 25)

PART D

*Answer **any two** questions. Each question carries **12** marks.*

28. A) By using transformation, solve $(x - 2y + 1)dx + (4x - 3y - 6)dy = 0$

    B) Find a Family of oblique trajectories that intersect the family of straight lines $y = cx$ at

       angle 45^0.

29. A) Solve $\dfrac{d^2 y}{dx^2} + y = \cos ecx$ by the method of variation of parameters.

    B) Solve the Cauchy's homogenous linear equation $x^2\dfrac{d^2 y}{dx^2} - 4x\dfrac{dy}{dx} + 6y = x^2$

30. Find the series solution of initial value problem $(x^2 - 1)y'' + 3xy' + xy = 0$ where

    $y(0) = 4,\ y'(0) = 6$

31 A) Solve the partial differential equation $z(xp - yq) = y^2 - x^2$

    B) Find a partial differential equation of all spheres whose centers lie on the z axis.

                                                                        (12 x 2 = 24)

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