Reg. No…….. Name……

# B.Sc. DEGREE END SEMESTER EXAMINATION: OCTOBER 2022

SEMESTER **5: MATHEMATICS** *(Common for B.Sc. Mathematics and B.Sc. Computer Applications)*

COURSE: **15U5CRMAT6 - 15U5CRCMT06: DIFFERENTIAL EQUATIONS**

*(Common for Supplementary 2015/2016/2017/2018 Admissions)*

Time: Three Hours Max. Marks: 75

## PART A

**Answer All (1 mark each)**

1. Find the value of $b$ for which the equation $(xy^2+bx^2y)dx+(x+y)x^2dy = 0$ is exact.
2. Solve the differential equation $y'=1+y^2$.
3. Find $(3D^2 + 5D - 2)t^3$.
4. Define Bernoulli's equation.
5. Find the wronskian of the functions $\{Cos2x, Sin2x\}$
6. What is the auxiliary equation of Lagrange's linear partial differential equation?
7. Solve $y'' - 4y' + 4y = 0$.
8. Solve the differential equation $y' + 2xy = 0$.
9. Write the Bessel's equation of order p.
10. Obtain the partial differential equation associated with the surfaces $x^2 + y^2 + (z - C)^2 = a^2$.

(1 x 10 = 10)

## PART B

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

11. Solve $x\frac{dy}{dx} + y = x^3\, y^6$
12. Obtain the general solution of the equation $16y''-8y'+145y=0$.
13. Find the orthogonal trajectories of the family of parabolas $y=cx^2$ .
14. Write a set of parametric equations of a surface $x^2+y^2+z^2=a^2$.
15. Solve the equation $xp + yq = 3z$
16. Prove that $J_1(0) = 0$
17. Solve the equation $x\, sin y\, dx + (x^2+ 1)\, cos y\, dy = 0$.
18. Show that the equation $(1 + 4xy + 2y^2)dx + (1 + 4xy + 2x^2)dy = 0$ is exact and solve it.
19. Find the singular point of $(x^3 + x^2)y'' + (x^2 - 2x)y' + 4y = 0$
20. Solve $p + q = x + y + z$.

(2 x 8 = 16)

## PART C

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

21. Solve $(x+2y+3)\, dx + (2x+4y-1)dy = 0$.
22. Find a power series solution in powers of $x$ of the differential equation $y'' + xy' + y = 0$.

23. Given that $y = x$ is a solution of $x^2 \frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 4y = 0$. Find a linearly independent solution and write the general solution.
24. Solve $(z - y)p + (x - z)q = y - x$
25. Solve $(x^2+y^2+yz)\, p+(x^2+ y^2-xz)q = z(x+y)$.
26. Find the general integral of $x(y-z)\, p+ y\,(z-x)\, q = z\,(x-y)$.
27. Reduce to first order $x^2 y'' - xy + y = 0$ and solve if $y = x$ is one of its solution.

(5 x 5 = 25)

**PART D**

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

28. Solve $(x - 2y+1)\, dx+(4x - 3y - 6)\, dy = 0$.
29. Solve the Bessel's equation of order $p$.
30. Use method of Frobenius to find the general solution of the differential equation

$$2x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x-5)y = 0$$

31. (a) Form the partial differential equation from $Z = xy + f(x^2+y^2)$
By eliminating the arbitrary function.
(b) Solve $(y + zx)\, p - (x + yz)\, q = x^2 - y^2$ (12 x 2 = 24)