

Reg. No.

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G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2024.

(For those admitted in June 2023 and later)



PROGRAMME AND BRANCH: B.Sc., MATHEMATICS

| SEM | CATEGORY | COMPONENT | COURSE CODE | COURSE TITLE |
|-----|------------|-----------|-------------|---|
| III | PART - III | CORE - 6 | U23MA306 | DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS |

Date & Session: 12.11.2024 / AN

Time : 3 hours

Maximum: 75 Marks

| Course Outcome | Bloom's K-level | Q. No. | SECTION - A (10 X 1 = 10 Marks) Answer ALL Questions. |
|----------------|-----------------|--------|---|
| CO1 | K1 | 1. | In solvable for y , $f(x, y, p) = 0$ can be put in the form _____. a) $y = F(x, p)$ b) $y = F(p, x)$ c) $x = F(p, y)$ d) $x = F(y, p)$ |
| CO1 | K2 | 2. | The operator D^2 is denoted by _____. a) $\frac{dy}{dx}$ b) $\frac{dx}{dy}$ c) $\frac{d^2y}{dx^2}$ d) $\frac{d^2x}{dy^2}$ |
| CO2 | K1 | 3. | The solution of $(D^2 - 5D + 4)y = 0$ is _____. a) $y = c_1e^x + c_2e^{4x}$ b) $y = c_1e^x - c_2e^{4x}$ c) $y = c_1e^{-x} + c_2e^{4x}$ d) $y = c_1e^x + c_2e^{-x}$ |
| CO2 | K2 | 4. | The solution of $\frac{1}{D^2 + a^2} \cos ax$ is _____. a) $\frac{x \sin ax}{a}$ b) $\frac{x \sin ax}{2a}$ c) $\frac{x \cos ax}{a}$ d) $\frac{x \cos ax}{2a}$ |
| CO3 | K1 | 5. | The solution of $\frac{d^2y}{dx^2} + \frac{dy}{dx} \tan x + y \cos^2 x = 0$ is _____. a) $A \cos(\sin x) + B \sin(\sin x)$ b) $A \cos(\sin x) - B \sin(\sin x)$ c) $A \sin(\sin x) + B \sin(\sin x)$ d) $A \cos(\cos x) + B \sin(\sin x)$ |
| CO3 | K2 | 6. | Which one of following is a linear form? a) $\frac{dy}{dx} + Py = 0$ b) $\frac{d^2y}{dx^2} + Py = 0$ c) $\frac{d^3y}{dx^3} + Py = 0$ d) $\frac{d^4y}{dx^4} + Py = 0$ |
| CO4 | K1 | 7. | The result of eliminating the arbitrary function from $z = f(x^2 + y^2)$ is _____. a) $py=qx$ b) $p=q$ c) $y=x$ d) $py=x$ |
| CO4 | K2 | 8. | Which one of following form is Clairant's form? a) $z = px + qy$ b) $z = px + qy + f(p, q)$ c) $z = px - qy$ d) $z = px + qy - f(p, q)$ |
| CO5 | K1 | 9. | A chemical reaction of growth and decay is called a _____. a) first order reaction b) second order reaction c) third order reaction d) nth order reaction |
| CO5 | K2 | 10. | The algebraic sum of electromotive forces around a closed circuit is _____. a) 0 b) 1 c) 2 d) n |

| Course Outcome | Bloom's K-level | Q. No. | SECTION - B (5 X 5 = 25 Marks) Answer ALL Questions choosing either (a) or (b) |
|----------------|-----------------|--------|--|
| CO1 | K3 | 11a. | Solve $y = xp + x(1 + p^2)^{1/2}$ (OR) |
| CO1 | K3 | 11b. | Solve $xp^2 - 2yp + x = 0$. |
| CO2 | K3 | 12a. | Solve $(D^3 + 5D + 6)y = e^x$. (OR) |
| CO2 | K3 | 12b. | Solve $(D^2 - 8D + 9)y = 8\sin 5x$. |
| CO3 | K4 | 13a. | Solve $x \frac{d^2y}{dx^2} - (2x-1) \frac{dy}{dx} + (x-1)y = e^x$. (OR) |
| CO3 | K4 | 13b. | Solve $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} - 5y = \sin(\log x)$. |
| CO4 | K4 | 14a. | Eliminate f and ϕ from the relation $z = f(x + ay) + \phi(x - ay)$. (OR) |
| CO4 | K4 | 14b. | Solve $(y + z)p + (z + x)q = x + y$. |
| CO5 | K5 | 15a. | If the population of a country doubles in 50 years in how many years will it treble under the assumption that the ratio of increase is proportional to the number of inhabitants? (OR) |
| CO5 | K5 | 15b. | Solve $L \frac{dI}{dt} + RI = E_0$ with the following initial conditions. I_0 is the current flow initially. E_0 is the constant electromotive force impressed on the circuit at $t=0$. |

| Course Outcome | Bloom's K-level | Q. No. | SECTION - C (5 X 8 = 40 Marks) Answer ALL Questions choosing either (a) or (b) |
|----------------|-----------------|--------|--|
| CO1 | K3 | 16a. | Solve $x^2 = 1 + p^2$. (OR) |
| CO1 | K3 | 16b. | Solve $\frac{dx}{dt} + 2x - 3y = t$; $\frac{dy}{dt} - 3x + 2y = e^{2t}$. |
| CO2 | K4 | 17a. | Solve $(D^3 - 2D + 4)y = e^x \cos x$. (OR) |
| CO2 | K4 | 17b. | Solve $(D^2 + 4)y = x \sin x$. |
| CO3 | K4 | 18a. | Solve $x^2 \frac{d^2y}{dx^2} - (x^2 + 2x) \frac{dy}{dx} + (x + 2)y = x^3 e^x$. (OR) |
| CO3 | K4 | 18b. | Solve $x^2 y'' - xy' + 4y = \cos(\log x) + x \sin(\log x)$ |
| CO4 | K5 | 19a. | Solve $(y^2 + z)px - (x^2 + z)qy = z(x^2 - y^2)$. (OR) |
| CO4 | K5 | 19b. | Solve $p^2 + q^2 = npq$. |
| CO5 | K5 | 20a. | In a certain chemical reaction the rate of conversion of a substance at time t is proportional to the quantity of the substance still untransformed at the instant. At the end of one hour 60 grams remain and at the end of 4 hours 21 grams remain. How many grams of the substance were there initially. (OR) |
| CO5 | K5 | 20b. | Explain Brachistochrone problem. |

