

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA
I year B.Sc., Degree Examinations - I Semester
Mathematics Course-I: Differential Equations
(w.e.f. 2020-21 Admitted Batch)

Total Hrs. of Teaching-Learning: 75 @ 6 hr/Week

Total credits: 05

Course Outcomes: After successful completion of this course, the student will be able to

- Solve linear differential equations
- Convert non exact homogeneous equations to exact differential equations by using integrating factors.
- Know the methods of finding solutions of differential equations of the first order but not of the first degree.
- Solve higher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients.
- Understand the concept and apply appropriate methods for solving differential equations.

COURSE SYLLABUS:

UNIT – I: Differential Equations of first order and first degree (12 Hours)

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables.

UNIT – II: Differential Equations of first order but not of the first degree (12 Hours)

Orthogonal Trajectories, Equations solvable for p ; Equations solvable for y ; Equations solvable for x ; Equations that do not contain x (or y); Equations homogeneous in x and y ; Equations of the first degree in x and y – Clairaut's Equation.

UNIT – III: Higher order linear differential equations-I (12 Hours)

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of $f(D)y=0$. General Solution of $f(D)y=Q$ when Q is a function of x , $\frac{1}{f(D)}$ is expressed as partial fractions.

P.I. of $f(D)y = Q$ when $Q = be^{ax}$

P.I. of $f(D)y = Q$ when Q is $b \sin ax$ or $b \cos ax$.

UNIT – IV: Higher order linear differential equations-II**(12 Hours)**

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of $f(D)y = Q$ when $Q = b x^k$

P.I. of $f(D)y = Q$ when $Q = e^{ax} V$, where V is a function of x .

P.I. of $f(D)y = Q$ when $Q = x V$, where V is a function of x .

P.I. of $f(D)y = Q$ when $Q = x^m V$, where V is a function of x .

UNIT –V: Higher order linear differential equations-III**(12 Hours)**

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's linear equations, miscellaneous differential equations.

Co-Curricular Activities:**(15 Hours)**

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving.

Prescribed Text Book:

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

Reference Books :

1. A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.
2. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi.
3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- Universities Press.
4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE-I, DIFFERENTIAL EQUATIONS

Unit	TOPIC	S.A.Q	E.Q	Marks allotted to the Unit
I	Differential Equations of first order and first degree	2	2	30
II	Differential Equations of first order but not of the first degree	2	2	30
III	Higher order linear differential equations-I	1	2	25
IV	Higher order linear differential equations-II	2	2	30
V	Higher order linear differential equations-III	1	2	25
Total		8	10	140

S.A.Q. = Short answer questions (5 marks)

E.Q = Essay questions (10 marks)

Short answer questions : 4 X 5 = 20

Essay questions : 4 X 10 = 40

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Total Marks = 60
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Model Paper (w.e.f. 2020-2021)

Time: 2Hrs 30 min

Max. Marks: 60

PART - I

Answer any FOUR questions. Each question carries FIVE marks.

4 X 5 M=20 M

1. Solve $(1 + e^{x/y})dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$.
2. Solve $(y - e^{\sin^{-1}x})\frac{dx}{dy} + \sqrt{1 - x^2} = 0$
3. Solve $y + px = p^2x^4$
4. Solve $(px - y)(py + x) = 2p$
5. Solve $(D^2 - 3D + 2) = \cos hx$
6. Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$
7. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = 8e^{3x} \sin 2x$
8. Solve $x^2y'' - 2x(1+x)y' + 2(1+x)y = x^3$

PART - II

Answer ALL the questions. Choose At least one from each section. Each question carries TEN marks.

4 X 10 M = 40

M

SECTION-A

9 (a). Solve $x\frac{dy}{dx} + y = y^2 \log x$

(Or)

(b). Solve $\left(y + \frac{1}{3}y^3 + \frac{1}{2}x^2\right)dx + \frac{1}{4}(x + xy^2)dy = 0$

10 (a). Solve $p^2 + 2py \cot x = y^2$

(Or)

(b). Find the orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, where a is the parameter.

11 (a). Solve $(D^3 + D^2 - D - 1)y = \cos 2x$

(Or)

(b). Solve $(D^2 - 3D + 2)y = \sin e^{-x}$

SECTION-B

12 (a). Solve $(D^2 - 2D + 4)y = 8(x^2 + e^{2x} + \sin 2x)$

(Or)

(b). Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = x e^x \sin x$

13 (a). Solve $(D^2 - 2D)y = e^x \sin x$ by the method of variation of parameters.

(Or)

(b). Solve $3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = x$