

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc. MATHEMATICS-SEMESTER I (w.e.f. 2017-2018)
COURSE: DIFFERENTIAL EQUATIONS

Total Hrs. of Teaching-Learning: 90 @ 6 hr/Week

Total credits: 05

OBJECTIVES:

- To classify differential equations by order, linearity and homogeneity.
- To compute solutions to various differential equations by using analytical techniques.
- To identify the appropriate method for solving the given differential equation.
- To get awareness about the applications.

Unit I: Differential Equations of First Order and First Degree (18 hours)
Exact differential equations, integrating factors, linear Differential equations, Differential equations reducible to linear form, Change of variables.

Unit II: Orthogonal Trajectories, Differential Equations of the First Order But Not of the First Degree (18 hours)
Orthogonal Trajectories, Equations solvable for p , Equations solvable for y , Equations solvable for x , Equations that do not contain x (or y), Clairaut's equation.

Unit III: Higher Order Linear Differential Equations (with constant coefficients) - I (18 hours)
Solution of homogeneous linear differential equations of order n with constant coefficients. Solution of non-homogeneous linear differential equations with constant coefficients $f(D)y = Q(x)$ by means of polynomial operators when $Q(x) = be^{ax}$, $Q(x) = b \sin ax$ or $b \cos ax$.

Unit IV: Higher Order Linear Differential Equations (With Constant Coefficients) -- II (18 hours)
Solution of the non-homogeneous linear differential equations with constant coefficients $f(D)y = Q(x)$ by means of polynomial operators when $Q(x) = bx^k$, $Q(x) = e^{ax}V$, $Q(x) = xV$ and $Q(x) = x^mV$.

Unit V: Higher Order Linear Differential Equations: (With Non Constant Coefficients) (18 hours)
Method of variation of parameters, Linear differential equations with non-constant coefficients, The Cauchy-Euler equation.

Additional Inputs:

1. Simultaneous differential equations
 2. Applications of 1st order and 1st degree differential equations.
- (No question to be set from this part)

Prescribed Text Books:

1. Scope as in "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, Volume-I published by S. Chand & Company.
2. Differential Equations by Santhi Narayana, S. Chand & Company.

**BLUE PRINT FOR QUESTION PAPER PATTERN
SEMESTER-I**

Unit	TOPIC	V.S.A.Q 1M	S.A.Q 5M	E.Q 8M	Marks allotted
I	Differential Equations of 1 st order and 1 st degree	1	1	2	22
II	Orthogonal Trajectories, Differential Equations of 1 st order but not of 1 st degree	1	1	2	22
III	Higher Order Linear Differential Equations (with constant coefficients) – I	1	1	1	14
IV	Higher Order Linear Differential Equations (with constant coefficients) – II	1	1	2	22
V	Higher Order Linear Differential Equations (with non constant coefficients)	1	1	1	14
TOTAL		5	5	8	94

V.S.A.Q. = Very short answer questions (1 mark)

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

E.Q. = Essay questions (8 marks)

Very short answer questions : $5 \times 1 = 05$

Short answer questions : $3 \times 5 = 15$

Essay questions : $5 \times 8 = 40$

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Total Marks = 60
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P.R. Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations – I Semester
Mathematics Course: Differential Equations
Paper I (Model paper w.e.f. 2017-2018)

Time: 2Hrs 30 min

Max. Marks: 60

PART-I

Answer **ALL** the questions. Each question carries 1 mark.

5 X 1 = 5 M

1. Write the condition for a differential equation of first order to be an exact differential equation.
2. Solve $(p - x)(p - y^2) = 0$.
3. Find y_c of the differential equation $(D^2 + 4D + 4)y = 3xe^{-2x}$.
4. Find the particular integral of $D^2y = x^2$.
5. In a D.E. $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, if $1 + P + Q = 0$ then what is a part of complementary function.

PART-II

Answer any **THREE** questions, each question carries 5 marks.

3 X 5 = 15 M

6. Solve $(e^y + 1)\cos x \, dx + e^y \sin x \, dy = 0$.
7. Solve $(py + x)(px - y) = 2p$.
8. Solve $\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = \sin 2x$.
9. Solve $(D^2 - 2D + 1)y = x^2e^{3x}$.
10. Solve $(D^2 - 2D)y = e^x \sin x$, by the method of variation of parameters.

PART-III

Answer any **FIVE** questions from the following by choosing at least **TWO** from each section. Each question carries 8 marks.

5 X 8 = 40 M

SECTION-A

11. Solve $\left(y + \frac{y^3}{3} + \frac{x^2}{2}\right)dx + \frac{1}{4}(x + xy^2)dy = 0$.
12. Solve $(1 + y^2)dx = (\tan^{-1}y - x)dy$.
13. Solve $y^2 \log y = xpy + p^2$.
14. Find the orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, where 'a' is a parameter.

SECTION-B

15. Solve $(D^2 - 4D + 3)y = \sin 3x \cdot \cos 2x$.
16. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = 8e^{3x} \sin 2x$.
17. Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = xe^x \sin x$.
18. Solve $(x^2D^2 + xD - 1)y = x^2e^x$.