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**

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OBJECTIVES: Module- I, II

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

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Module I

Unit 1: 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 2: 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.

Module II

Unit 3: 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 the non-homogeneous linear differential equations with constant coefficients $f(D)y = Q(x)$ by means of polynomial operators when $Q(x) = be^{ax}, Q(x) = b\sin ax \;\; or \;\; bcos\, ax$.

Unit 4: 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 5: Higher Order linear differential equations: (withNon 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 1^{st} order and 1^{st} degree differential equations.
   (No question to be set from this part)

Prescribed Text Books:

1. Scope as in "Differential Equations and their applications by ZafarAhsan, 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 bySanthiNarayana, S.Chand& Company.

BLUE PRINT FOR QUESTION PAPER PATTERN
SEMESTER-I

Unit	TOPIC	V.S.A.Q	S.A.Q	E.Q	Marks allotted
1	Differential Equations of 1^{st} order and 1^{st} degree	1	1	2	22
2	Orthogonal Trajectories, Differential Equations of 1^{st} order but not of 1^{st} degree	1	1	2	22
3	Higher Order Linear Differential Equations (with constant coefficients) – I	1	1	1	14
4	Higher Order Linear Differential Equations (with constant coefficients) – II	1	1	2	22
5	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 X 1 =05
Short answer questions : 3 X 5 =15
Essay questions : 5 X 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: 2 1/2 Hrs **Max. Marks: 60**

Part-I

Answer ALL the questions. Each question carries 1 mark. 5X1M = 5M

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 five marks. 3X5M=15M

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 FIVE questions from the following by choosing at least TWO question from each section. Each question carries 8 marks. 5X8M=40M

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 $(D^2-4D+3)y=\sin 3x.\cos 2x$
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 $x^2y''-2x(1+x)y'+2(1+x)y=x^3$.