ADIKAVI NANNAYA UNIVERSITY
RAJAMAHENDRAVARAM-533296.
SEMESTER- I: DIFFERENTIAL EQUATIONS
MATHEMATICS PRACTICALS
(W.E.F 2022 ADMITTED BATCH)

GUIDELINES

1.EVALUATION PROCESS

No. of Students per Batch	No. of hours per week	Max. Marks	Credits
30	2	50	1

2.DIVISION OF MARKS

Test	Record	Viva-voce	Total
30 Marks	10 Marks	10 Marks	50 marks

NOTE: Practical should be evaluated by both Internal and External examiners. Remuneration will be given as per university norms.

3. BLUE PRINT FOR TEST

Time: 3 hours   Max. Marks: 30

Question Paper contains two sections A and B.
Answer any FIVE Questions choosing at least TWO from each section.
Each question carries 6 Marks.   5 X 6 = 30 marks

UNIT	No. of questions	
	Section-A	Section-B
I	2	----
II	2	----
III	1	1
IV	----	2
V	----	2

NOTE : 3 hours duration time includes record verification and Viva- Voce.

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QUESTION BANK FOR PRACTICALS
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UNIT-I

1) Solve $\left(1 + e^{\frac{x}{y}}\right) dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right) dy = 0$

2) Solve $y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$

3) Solve $x^2 y dx - (x^3 + y^3)dy = 0$

4) Solve $y^2 dx + (x^2 - xy - y^2)dy = 0$

5) Solve $(x^3y^3 + x^2y^2 + xy + 1)y\, dx + (x^3y^3 - x^2y^2 - xy + 1)x\, dy = 0$

6) Solve $(x^2 + y^2)dx - 2xy dy = 0$

7) Solve $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$

8) Solve $x\frac{dy}{dx} + 2y - x^2 \log x = 0$

9) Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x \sin x$

10) Solve $x \cos x \frac{dy}{dx} + (x \sin x + \cos x)y = 1$

11) Solve $\left(y - e^{\sin^{-1}x}\right)\frac{dx}{dy} + \sqrt{1 - x^2} = 0$

12) Solve $(1 + y^2)dx = (\text{Tan}^{-1} y - x)\, dy$

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

14) Solve $x\frac{dy}{dx} + y = y^2 \log x$

15) Solve $\frac{dy}{dx}(x^2y^3 + xy) = 1$

UNIT-II

1) Solve $x + yp^2 = (1 + xy)p$

2) Solve $p^2 + 2py \cot x = y^2$

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

4) Solve $x^2\left(\frac{dy}{dx}\right)^2 + xy\frac{dy}{dx} - 6y^2 = 0$

5) Solve $xy^2(p^2 + 2) = 2py^3 + x^3$

6) Solve the differential equation $x^2p^2 + 3xyp + 2y^2 = 0$, where $p = \frac{dy}{dx}$.

7) Solve $xyp^2 + p(3x^2 - 2y^2) - 6xy = 0$

8) Solve $y^2 \log y = xpy + p^2$

9) Solve $2px = 2\tan y + p^3 \cos^2 y$

10) Solve $y = 2px - p^2$

11) Solve $xp^2 - 2yp + x = 0$
12) Solve $y = 2px + p^4x^2$
13) **Define a Clairaut's equation. Solve** $\sin px \cos y = \cos px \sin y + p$.
14) Solve $(px - y)(py + x) = 2p$.
15) Solve the differential equation $x^2(y - px) = yp^2$.

UNIT-III

1) **Solve i)** $\frac{d^2y}{dx^2} - 7\frac{dy}{dx} + 12y = 0$ **and ii)** $\frac{d^4y}{dx^4} - 2\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 1 = 0$.
2) Solve $(D^3 - 2D^2 - 5D + 6)y = 0$ when $x = 0, y = 1, y' = -7, y'' = -1$
3) **Solve** $\frac{d^2y}{dx^2} + 4c + 3y = e^{2x}$.
4) Solve $(D^2 - 3D + 2)y = \cosh x$
5) Solve $(D^3 - 4D^2)y = 5$.
6) **Solve** $\frac{d^2y}{dx^2} - (a + b)\frac{dy}{dx} + aby = e^{ax} + e^{bx}$
7) Solve $(D^2 - 3D + 2)y = e^{3x}$,given that y=0 when $x = 0$ and $x = \log_e 2$
8) Solve $(D^2 - 2D + 1)y = (1 + e^{-x})^2$
9) Solve $(D^2 - 4)y = \sin 2x$
10) Solve $(D^2 + 9)y = \cos^3 x$.
11) **Solve** $\frac{d^2y}{dx^2} + a^2\frac{dy}{dx} = \sin ax$.
12) Solve $(D^2 + a^2)y = \tan ax$
13) Solve $(D^2 + 16)y = e^{-4x} + \cos 4x$.
14) Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$
15) Solve $(D^2 - 4)y = e^x + \sin 2x + \cos^2 x$

UNIT-IV

1) Solve $(D^2 - 4)y = x^2$
2) Solve $(D^2 - 4D + 4)y = x^3$
3) Solve $D^2(D^2 + 4)y = 320(x^3 + 2x^2)$
4) Solve $(D^2 - 5D + 6)y = xe^{4x}$.
5) Solve $(D^2 + 3D + 2)y = e^{-x} + x^2 + \cos x$.
6) Solve $(D^2 - 4D + 3)y = 2xe^{2x} + 3e^x \cos 2x$.
7) Solve $(D^2 - 2D + 4)y = 8(x^2 + e^{2x} + \sin 2x)$
8) **Solve** $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = 8e^{3x} \sin 2x$
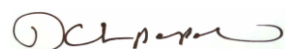9) Solve $(D^2 - 4D + 1)y = e^{2x} \cos^2 x$

10) Solve $(D^2 - 2D + 1)y = x^2 e^{3x}$

11) Solve $(D^2 + 4)y = \ xsinx$

12) Solve $(D^2 + 1)y = x^2 sin2x$

13) Solve $(D^4 + 2D^2 + 1)y = x^2 cosx$

14) Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = xe^x \ sinx$

15) Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} sin2x$

UNIT-V

1) **Solve** $x^2 \frac{d^2y}{dx^2} - 2x(1 + x)\frac{dy}{dx} + 2(1 + x)y = x^3.$

2) **Solve** $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2 y = 0.$ **given that** $e^{a sin^{-1} x}$ **is an integral.**

3) **Solve** $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = \ 2 x^2.$

4) **Solve** $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10\left(x + \frac{1}{x}\right)$

5) **Solve** $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2 \sin(logx)$

6) **Solve** $x^2 \frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x.$

7) Solve $[(1 + x)^2 D^2 + (1 + x)D + 1]y = 4 \cos \log(1 + x)$

8) Solve $[(1 + 2x)^2 D^2 - 6(1 + 2x)D + 16]y = 8(1 + 2x)^2$

9) Solve $[(2x + 3)^2 D^2 - 2(2x + 3)D - 12]y = 6x$

10) Solve $(D^2 + a^2)y =$ tanax by the method variation of parameters.

11) Solve $(D^2 + 1)y =$ cosecx by the method variation of parameters.

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

13) Solve $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = \ x^2 e^x$ by the method variation of parameters.

14) Solve $(D^2 - 3D + 2)y = \cos(e^{-x})$ by the method variation of parameters.

15) Solve $(D^2 - 2D + 2)y = e^x tanx$ by the method variation of parameters.

NOTE: The above problems are only suggested, problems can be chosen from the Applications of Differential Equations according to the convenience and creativity of the Staff and Student.

BOS MEMBERS

1. Dr.D.CH.PAPARAO

2. G.SRIDHAR

3. K. REVATHI
(University Representative)

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MODEL PAPER

Time: 3 hours   Max. Marks: 30

Question Paper contains two sections A and B.
Answer any FIVE Questions choosing at least TWO from each sections A and B.
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SECTION-A

1. Solve $y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$

2. Solve $x \cos x \frac{dy}{dx} + (x \sin x + \cos x)y = 1$

3. Solve $p^2 + 2py \cot x = y^2$

4. Solve $y = 2px - p^2$

5. Solve $(D^2 - 3D + 2)y = \cosh x$

SECTION-B

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

7. Solve $(D^2 - 4D + 1)y = e^{2x}\cos^2 x$

8. Solve $(D^2 + 4)y = x \sin x$

9. Solve $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2 \sin(\log x)$

10. Solve $(D^2 + a^2)y = \tan ax$ by the method variation of parameters.