GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ENGINEERING
I YEAR

SEMESTER SYSTEM

L - SCHEME

2011 - 2012

II SEMESTER

ENGINEERING MATHEMATICS - IV

CURRICULUM DEVELOPMENT CENTER

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING - SYLLABUS

L-SCHEME

(Implements from the Academic Year 2011-2012 on wards)

Course Name : All Branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and Film & TV

Subject Code : **22003**

Semester : II Semester

Subject Title : **ENGINEERING MATHEMATICS – IV**

TRAINING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Engineering Mathematics - IV	5 Hrs.	80 Hrs.	25	75	100	3 Hrs

Topics and Allocation of Hours:

Sl.No.	Topic	Time (Hrs.)
1	Complex Numbers – I	14
2.	Complex Numbers – II	14
3.	Probability Distribution-II	14
4.	Application of Integration and differential equation	14
5.	Second order differential equation	14
	Tutorial	10
	Total	80

Rationale: The study of mathematics is very much needed , as the new disciplines like, information technology, genetics engineering, biotechnology, mechatronics etc are based on mathematics. This subject is the extension of other mathematic subjects studied in first and second semester and is the stepping stone to learn applied mathematics.

Objectives: At the end of the training programme the student will be able to solve polynomial equations with complex solutions, and solve the physical problems in fluid dynamics and circuit theory using the concept of differential equations.

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LEARNING STRUCTURE:

Application	Unit – I	Unit – II	Unit – III	Unit –IV	Unit - V
	To solve polynomial equations with complex root in the Engineering problem.		To Estimate, in industries, from the available information	To solve differential equations arising in Electrical and Electronics Engineering.	

Procedure					
	To explain method to evaluate algebra of complex numbers in cartesian and polar form	To explain the use of Demoivre’s Theorem in evaluating of multiplication and division of complex number and method to solve polynomial equation.	To find probabilities using Poisson and normal distributions fitting a straight line using given data.	To find area under curve volume generated by curves using integration. Solution of differential equation using Integration.	To explain the method to find complimentary function and particular integral and hence solution of differential equation.

Concepts					
	Algebra of complex numbers, relation between Cartesian and polar form of complex numbers. Complex number as a point on the Argand plane.	To explain the method to use Demoivre’s Theorem for evaluation of multiplication and division of complex numbers.	Method to find probability using Poisson and normal distribution. Method to fit straight using least square method.	Area of circle volume of cone and sphere. Method to solve variable separable and linear type.	Solution of second order differential equation as sum of complimentary function and particular integral.

Facts					
	Definition of complex numbers, conjugates modulus amplitude Argand plane.	Demoivre’s Theorem root of complex number using Demoivre’s Theorem.	Definition of Poisson and normal distribution Basics of curve fitting.	Area and volume using integration. Order and degree of differential equation.	Concept of second order Differential Equation

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF TOPICS	Hours	Mark
I	**COMPLEX NUMBERS – I** **1.1**. Definition – Conjugates - Algebra of complex numbers (geometrical proof not needed) – Real and Imaginary parts. Simple Problems.	5	8
	1.2. Polar form of complex number – Modulus and amplitude form multiplication and division of complex numbers in polar form. Simple Problems	5	7
	1.3 Argand plane – Collinear points, four points forming square, rectangle, rhombus. Simple Problems.	4	7
II	**COMPLEX NUMBERS – II** **2.1** Demoivre's Theorem (statement only) – simple problems.	4	7
	2.2. Demoivre's Theorem related problems. Simple Problems.	5	7
	2.3 Finding the n^{th} roots of unity - solving equation of the form $x^n \pm 1=0$ where $n \leq 7$. Simple Problems.	5	8
III	**PROBABILITY DISTRIBUTION - II** **POISSION DISTRIBUTION** **3.1**. Definition – $P(X=x) = \dfrac{e^{-\lambda}\lambda^{x}}{x!}$ x=0,1,2……………………….. (Statement only). Expression for mean and variance. Simple Problems.	5	8
	NORMAL DISTRIBUTION **3.2** Definition of normal and standard normal distribution. (Statement only). Constants of normal distribution (results only) – Properties of normal distribution – Simple Problems using the table for standard normal distribution.	5	7
	CURVE FITTING **3.3**. Fitting of straight line using least square method (Result only) Simple Problems	4	7
IV	**APPLICATION OF INTEGRATION AND FIRST ORDER DIFFERENTIAL EQUATION** **AREA AND VOLUME** **4.1**. Area – Area of circle, Volume – Volume of cone and sphere. Simple Problems.	5	7

UNIT	NAME OF TOPICS	Hours	Mark
IV	**FIRST ORDER DIFFERENTIAL EQUATION** **4.2**. Definition of order and degree of differential equation – Solution of first order variable separable type differential equation. Simple Problems.	5	8
	LINEAR TYPE DIFFERENTIAL EQUATION **4.3**. Solution of linear differential equation. Simple Problems.	4	7
V	**SECOND ORDER DIFFERENTIAL EQUATIONS** **5.1** Solution of second order differential equations with constant coefficients in the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = o$. Simple Problems.	4	7
	5.2 Solution of second order differential equations in the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = f(x)$ where a , b and c are constants and f(x) = e^{mx}. Simple Problems.	5	8
	5.3. Solution of second order differential equation in the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx}$ +cy=f(x) where a, b and c are constants and f(x) = sinmx or cosmx. Simple Problems.	5	7

Text Book:

Mathematics for Higher Secondary – I year and II year (Tamil nadu Text Book Corporation)

Reference Book:

Engineering Mathematics - Dr.M.K.Venkatraman, National Publishing Co, Chennai
Engineering Mathematics – Dr.P.Kandasamy & Others, S.Chand & Co Ltd, New Delhi

MODEL QUESTION PAPER – 1

ENGINEERING MATHEMATICS- IV

Time --- three hours (Maximum Marks: 75)

PART – A

(Marks: 15 x 1 = 15)

Answer any fifteen (15) questions:

1. Find the value of $i^2 + i^3 + i^4$
2. If $z_1 = 1 + i$, $z_2 = 3 + 2i$ the find $3z_1+4z_2$.
3. Find the modulus and amplitude of $\frac{1}{2} + i\frac{\sqrt{3}}{2}$
4. Find the distance between the complex numbers 2 + I and 1 – 2i.
5. Find the value of $(cos\theta + isin\theta)^2(cos3\theta + isin3\theta)^{-3}$
6. If x=$(cos\theta + isin\theta)$, what is the value of $x^m + 1/x^m$
7. If ω is a cube root of unity, then find the value of $1 + \omega^2 + \omega^4$.
8. Simplify $(1+ \omega)(1+ \omega^2)$
9. If the mean of the Poisson distribution is 2, find P(X=0).
10. Give two examples of Poisson distribution.
11. State the normal distribution.
12. Write down the normal equations to fit a straight line y = ax+b.
13. Find the area bounded by the curve $y = x^2$ and x-axis between x = 0 and x = 2.
14. Solve xdx + ydy = 0.
15. Find the solution of $\frac{dy}{dx} + ysinx = 0$.
16. Find the integrating factor of $\frac{dy}{dx} - ycotx = sinx$.
17. Find the solution of $(D^2 - 1)y = 0$

18. Find the complementary function of $(D^2 + 1)y = e^{2x}$

19. Find the particular integral of $(D^2 + 5D + 6)y = 13$

20. Find the auxiliary equation of $(D^2 + 9)y = \sin 4x$

PART - B

(Marks: 5 x 12 = 60)

[N.B :- (1) Answer all questions choosing any two divisions from each question.
(2) All questions carry equal marks.]

21 (a) Find the real part and imaginary part of the complex number $\frac{(1+i)(2-i)}{1+3i}$

(b) Find the modulus and amplitude of the complex number $\frac{1+\sqrt{3}i}{1+i}$

(c) Show that the complex numbers (2 – 2i), (8 + 4i), (5 +7i), (-1 + i) form a rectangle.

22 (a) Simplify $\frac{(cos2\theta + isin2\theta)^5 (cos3\theta - isin3\theta)^4}{(cos3\theta + isin3\theta)^2 (cos4\theta + sin4\theta)^{-5}}$

(b) If n is a positive integer, prove that $\left(\sqrt{3} + i\right)^n - \left(\sqrt{3} - i\right)^n = 2^{n+1} \cos\frac{n\pi}{6}$

(c) Solve: $x^7 + 1 = 0$

23 (a) In a Poisson distribution if P(X=3) = P(X=2) find P(X=0) and P(X=1).

(b) If X is normally distributed with mean 80 and standard deviation 10 find P(70≤ x ≤100).

(c) Fit a straight line for the following data.

X	0	1	2	3	4
Y	10	14	19	26	31

24 (a) Find the volume of a right circular cone of base radius r and altitude h by Integration.

(b) Solve $\frac{dy}{dx} + \frac{1+cos2y}{1+cos2x} = 0$

(c) Solve $\frac{dy}{dx} + ycotx = 4xcosecx$

25 (a) Solve : $(D^2 + 36)y = 0$ when $x = 0$, $y = 2$ and when $x = \frac{\pi}{2}$, $y = 3$

(b) Solve : $(3D^2 + D - 14)y = 13e^{2x}$

(c) Solve $(D^2 - 5D + 6)y = 2cos3x$

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MODEL QUESTION PAPER – 2

ENGINEERING MATHEMATICS – IV

Time --- three hours (Maximum Marks: 75)

PART – A

(Marks: 15 x 1 = 15)

Answer any fifteen (15) questions

1. Find the conjugate of (1 + i) (1 – 2i).
2. If $z_1 = 2 + i$, $z_2 = 3 - 2i$ the find z_1/z_2
3. Find the quadratic equation whose root is 3 -2i.
4. Find the distance between the complex numbers 2 - I and 5 – 2i
5. State De Moivre's theorem.
6. Simplify $\frac{\cos 5\theta + i\sin 5\theta}{\cos 4\theta - i\sin 4\theta}$
7. If ω is a cube root of unity, find the value of $\omega^4 + \omega^5 + \omega^6$.
8. Solve $x^2 + 16 = 0$
9. If the mean of Poisson distribution is 1 state its probability distribution.
10. How many values does the Poisson variable take?
11. If Z is the standard normal variable find the value of $\int_{-\infty}^{\infty} f(z)dz$
12. State the normal equations to fit the straight line y=mx+c
13. Find the area bounded by the curve $y = x^3$ and x axis between x = 0 and x = 1.
14. Write the order and degree of the differential equation $y = x\frac{dy}{dx} + \left(\frac{dy}{dx}\right)^2$
15. Find the solution of $\frac{dy}{dx} = 2xy$
16. Find the integral factor of $\frac{dy}{dx} + \frac{2xy}{1+x^2} = 1 + x^3$

17. Solve $(D^2 + 9)\,y = 0$

18. Find the particular integral of $(D^2 - 3D + 2)y = e^{-x}$

19. Find the complimentary function of $(D^2 - 5D + 6)y = e^x$

20. Find the particular integral of $(D^2 + 25)y = cos x$

Part - B
(Marks : 5 x 12 = 60)

[N.B :- (1) Answer all questions choosing any two divisions from each question.
(2) All questions carry equal marks.]

21 (a) Find the real and imaginary parts of conjugate of the complex number $\frac{(1+i)(2-i)}{(2+i)^2}$

(b) Find the modulus and amplitude of the complex number $\sqrt{3} - i$

(c) Show that the complex numbers (9 + i), (4 + 13i), (-8 + 8i), (-3 - 4i) form a Square.

22 (a) Simplify $\frac{(cos2\theta - isin2\theta)^4 (cos4\theta + isin4\theta)^{-5}}{(cos3\theta + isin3\theta)^2 (cos5\theta - sin5\theta)^{-3}}$

(b) If *a = cos2α + sin2α, b = cos2β + sin2β, c = cos2γ + sin2γ , prove that*

(i) $\sqrt{abc} + \frac{1}{\sqrt{abc}}$ = 2cos(α + β + γ) *(ii)* $\frac{a^2\, b^2 + c^2}{abc}$ =2cos2(α + β –γ)

(c) Solve $x^5 + 1 = o$

23 (a) If 3% of electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs exactly 5 are defective.

(b) The mean score of 1000 students in an examination is 36 and standard deviation is 16. If the score of the students is normally distributed how many students are expected to score more than 60 marks.

(b) Using the method of least squares fit the straight line

X	0	1	2	3	4
Y	1	1	3	4	6

24 (a) Find the volume of a sphere of radius *r* by Integration.

(b) Solve $(1 - e^x) \sec^2 y dy + 3 e^x \tan y dx = 0$

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

25 (a) Solve : $(D^2 + D + 1)y = 0$

(b) Solve : $(D^2 - 13D + 12)y = 2e^{-2x} + 5$

(c) Solve : $(D^2 + 16)y = \sin 9x$

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