STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
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

Semester : I Semester

Subject Title : Mathematics - II

Training and Scheme of Examination: **No. of Weeks per Semester: 16 Weeks**

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
Mathematics - II	4 Hrs.	64 Hrs.	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

Topics and Allocation of Hours:

Sl.No.	Topic	Time (Hrs.)
1	Circles	11
2.	Family of Circles. Functions and Limits.	11
3.	Differentiation methods	11
4.	Application of Differentiation – I	11
5.	Application of Differentiation – II	11
	Tutorial	9
	Total	64

Rationale: The basic idea of Engineering is to develop new technologies for the effective use of materials and to produce maximum outputs thereby attain maximum profit. Differentiation is one of the major tools in the mathematics used in all fields of Engineering with these basic ideas of utilizing minimum resource and attaining maximum profit

Objectives: The student will be able to acquire knowledge of differentiation, principles and different methods, develop the ability to apply these methods to solve technical problems to execute management plans with precision.

Learning Structure:

Application	Use of derivatives in the field of Geometry to find slopes of tangents and normal in the field of physics in finding velocity and acceleration and in the field of engineering to find maxima and minima				

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Procedure	To explain usage equation of circle, length of tangent to find location of a point with respect to a circle, equation of tangent to the circle.	To explain the usage of concentric and orthogonal circles. To explain the usage of limits.	To explain the usage of derivatives of standard functions and different methods of differentiations.	To explain the usage of derivative in finding rate measure, velocity and acceleration equations of tangent and normal.	To explain the usage of differentiation in finding maximum and minimum. To explain the method of finding partial derivatives.

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Concepts	Different forms of equation of circles length and equation of tangent.	Equation of concentric and orthogonal circles Different types of functions.	Derivations of standard functions. Different methods of differentiation.	Usage of derivative in rate measure, velocity and acceleration finding tangents to a curve.	Usage of differentiation in finding maximum and minimum Partial differentiation for more than one variable Euler's Theorem.

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Facts	Circle, centre and radius	Definition of functions and limit. Meaning of lim $x \to a$.	Definition of Differentiation Order of Derivative	Derivate as rate measure and slope of tangents.	Definition of increasing and decreasing function. Definition of partial differentiation.

CONTENTS:

Chapter No.	NAME OF TOPICS	Hours	Marks
1.	**CIRCLES**		
	1.1 Equation of circle – given centre and radius. General Equation of circle – finding centre and radius.	4	8
	1.2 Equation of circle through three non collinear points – Concyclic points. Equation of circle on the lining the points (x_1,y_1) and (x_2,y_2) as diameter.	3	7
	1.3 Length of tangent position of a point with respect to a circle, Equation of tangent (Derivation not required)	4	7
2.	**FAMILY OF CIRCLES**		
	2.1 Concentric circles – Contact of circles (internal and external) Orthogonal circles – Condition for Orthogonal circles (result only).	4	7
	FUNCTIONS AND GRAPHI 2.2. Cartesian products – relations – functions. Types of functions – onto, one to one, identity, inverse. Composition, sum, difference product and quotient of functions. Linear, Polynomial, rational, exponential,reciprocal, step, signum, trigonometrical functions (definition and graph only)	4	8
	LIMITS : 2.3. Definition of Limits $\lim_{x \to a} \frac{x^n-a^n}{x-a}$ a^{n-1}, $\lim_{\theta \to o} \frac{\sin\theta}{\theta}$ $\lim_{\theta \to o} \frac{\tan\theta}{\theta}$ 1 (θ in radian) (results only) problems using the above results.	3	7
3.	**DIFFERENTIATION**		
	3.1.Definition – Differentiation of x^n, sinx, cosx, tanx, cotx, secx, cosecx, logx, e^x, u±v, uv, u/v (results only) problems using the above results.	4	7
	3.2. Differentiation of function functions and implicit functions.	3	7
	3.3. Differentiation of Inverse Trigonometric functions and parametric functions.	4	8
4.	**APPLICATION OF DIFFERENTIATION – I**		
	4.1. Successive differentiation upto second order (parametric form not included). Definition of differential equation, formation of differential equation.	4	7
	4.2. Derivative as rate measure - velocity and acceleration.	3	7
	4.3. Tangents and Normals.	4	8
5.	**APPLICATION OF DIFFERENTIATION – II**		
	5.1 Definition of Increasing function, Decreasing function and turning points. Maxima and Minima (for single variable only).	3	7
	PARTIAL DIFFERENTIATIION : 5.2. Partial differentiation of two variable upto second orders only.	4	8
	5.3. Definition of Homogeneous functions – Euler's Theorem.	4	7

MODEL QUESTION - PAPER - I

MATHEMATICS - II

Time : 3 Hours Max. Marks:75

PART - A

I. ***Answer any 15 Questions***: 15 x 1 = 15

1) Find the centre and radius of the circle $x^2 + y^2 + 4x - 2y + 3 = 0$
2) Find the equation of the circle with centre (-2, -4) and radius 5 Units.
3) Write down the equation of the circle with end points of a diameter (x_1, y_1) and (x_2,y_2)
4) Show that the point (5, -12) lies outside the circle $x^2+y^2-2x+2y-60=0$
5) State the condition for two circles to cut orthogonally
6) Define function.
7) Define identity function.
8) Evaluate $\displaystyle \operatorname*{Lt}_{x \to 0} \frac{\sin 2x}{3x}$
9) Find $\dfrac{d}{dx}\left\{ \dfrac{1}{x^3} + 7\cos x \right\}$
10) Find $\dfrac{d}{dx}\left\{ x^4 \tan x \right\}$
11) Find $\dfrac{d}{dx}[\cos(\log x)]$
12) Find $\dfrac{d}{dx}[\sin^{-1}(\sqrt{x})]$
13) Find $\dfrac{d^2y}{dx^2}$ if y= tanx
14) Find the differential equation by eliminating constant r, from $x^2+y^2=r^2$
15) If the distance s given by $s=3t^2 +5t+7$, find the velocity when t=3 seconds.
16) Find the slope the tangent to the curve $y=x^2-5x+2$ at the point (1,-2).
17) Show that the function $y=4x-x^2+7$ is the maximum at x=2.
18) If $u = x^3 + 5x^2y+y^3$ find $\dfrac{\partial u}{\partial x}$, $\dfrac{\partial u}{\partial y}$
19) If $u = \log(x^2+y^2)$ find $\dfrac{\partial u}{\partial x}$
20) State Euler's Theorem.

PART - B

Answer any TWO subdivisions in each question: *5* x 12 = 60

21 a) Find the equation of the circle passing through the point (-9,1) And having centre at (2,5)

b) Find the equation of the circle passing through the points (0,1),(2,3)and (-2,5)

c) Find the equation of the tangent at (5, -2) to the circle $x^2 + y^2 - 10x - 14y - 7 = 0$

22.a) Show that the circles $x^2 + y^2 - 4x + 6y + 8 = 0$ and $x^2 + y^2 - 10x - 6y + 14 = 0$ touch each other.

b) Define and draw graph of 1) absolute function 2) x exponential function (e^x)

c) Evaluate $\lim_{x \to 3} \dfrac{x^5 - 243}{x^3 - 27}$

23.a)Differentiate the following:-

(i) $y = e^x \log x \sin x$, (ii) $y = \dfrac{x^2 + \sin x}{x - \cos x}$

b) Find $\dfrac{dy}{dx}$ if (i) $y = \log(\sec x + \tan x)$ (ii) $ax^2 + 2hxy + by^2 = 0$

c) Find $\dfrac{dy}{dx}$ if (i) $y = \cos^{-1} \dfrac{1-x^2}{1+x^2}$ (ii) $x = a(t + \cos t)$, $y = a(1 + \sin t)$

24.a) If $y = x^2 \cos x$, prove that $x^2 y_2 - 4xy_1 + (x^2+6)y = 0$

b) A missile is fired from the ground level rises x meters vertically upwards in time 3 seconds and $x = 100t - \dfrac{25}{2} t^2$. Find the initial velocity and maximum height of the missile

c) Find the equation of the tangent and normal to the curve $y = x^2 - x + 1$ at (2,3).

25.a) Find the maximum and minimum values of $2x^3 - 15x^2 + 36x + 18$

b) If $u = x^3 - 2x^2y + 3xy^2 + y^3$, Find $\dfrac{\partial u}{\partial x}$ and $\dfrac{\partial u}{\partial y}$

c) If $u = x^2 + y^2$ prove that $x \dfrac{\partial u}{\partial x} + y \dfrac{\partial u}{\partial y} = 2u$

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MODEL QUESTION - PAPER - II

MATHEMATICS - II

Time : 3 Hours Max. Marks:75

PART - A

I. ***Answer any 15 Questions***: 15 x 1 = 15

1) Find the equation of the circle with centre (2,0) and radius 10 units.

2) Find the centre and radius of the circle $x^2 + y^2 = 4$

3) Find the equation of the circle with the points (1, -1) and (2, 2) joining as diameter.

4) Show that the point (9, 2) lies on the circle $x^2 + y^2 - 6x - 10y - 11 = 0$

5) Show that this circles x2+y2-10x+4y-3=0 and x2+y2-10x+4y+19=0 are concentric circles.

6) State when a function is called bijective function.

7) Define linear function.

8) Evaluate $\lim_{x \to 3} \frac{x^3 - 3^3}{x - 3}$

9) Find $\frac{dy}{dx}$ if $y = \frac{1}{x^2} + \frac{2}{x} + \frac{3}{2}$

10) Find $\frac{dy}{dx}$ if $y = e^x \log x$

11) Find $\frac{dy}{dx}$ if $y = \cos^4 x$

12) Find $\frac{dy}{dx}$ if $y = \tan^{-1}(x^2)$

13) Find $\frac{d^2y}{dx^2}$ if $y = \sin (2x)$

14) Find the differential equation by eliminating the constants from $y=ax^2+b$

15) if $s =ae^t+be^{-t}$, Show that acceleration is always equal is to distance
16) Find the slope of the normal to the curve $y = x^2 + 7x$ at (1,0)
17) Find the minimum value of $y = x^2 + 4x + 1$
18) Show that the function y=sinx is decreasing in the interval $(\pi/2,\pi)$.

19) If $u = \tan(ax+by)$ find $\frac{\partial u}{\partial x}$

20) Show that $\left\{\frac{x2+y2}{x-y}\right\}$s homogeneous find state the order of the function.

PART - B

Answer any TWO sub division from each Question:- *5 x 12 = 60*

21.a) Find the equation of the circle, two of whose diameters are $x + y = 6$ and $x + 2y = 4$ and whose radius is 10 Units.

b) Find the equation of the circle passing through (0, 1) and (4, 3) and having its centre on the line $4x - 5y - 5 = 0$

c) Find the equation of the tangent at (4, 1) on the circle $x^2 + y^2 - 2x + 6y - 15 = 0$

22 a) Find the equation of the circle which passes through the origin and cuts Orthogonally with circles $x^2 + y^2 - 8y + 12 = 0$ and $x^2 + y^2 - 4x - 6y - 3 = 0$

b) Define and draw graph of Step functions

c) Evaluate $\lim_{x \to 0} \frac{\sin 10x}{\sin 7x}$

23 a) Find $\frac{dy}{dx}$ if (i) $y = \frac{a}{x^2} \underset{x^3}{+} \frac{b}{x} + c$

(ii) $y = (x^2 - 5) \cos x \log x$

.b) Find $\frac{dy}{dx}$ if (i) $y = \sin(e^e \log x)$ (ii) $x^3+y^3=3axy$

c) Find $\frac{dy}{dx}$ if (i) $y = \tan^{-1}\frac{2x}{1-x^2}$ (ii) $x = at^2, \quad y = 2at$

24 a) If y=a cos(logx)+b sin(logx) prove that $x^2y_2+xy_1+y=0$

.b) If the distance an time formula is given by s=2t3-15t2+36t+7, find the time when the velocity becomes zero.

c) Find the equation of the tangent and normal to the curve $y = 6 + x - x^2$ at (2, 4)

25a) Find the maximum and minimum value of $y = 4x^3 - 18x^2 + 24x - 7$.

b) If u = log (x2+y2) find $\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$

c) If $u = \tan^{-1}\frac{x^3 + y^3}{x - y}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$

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