

BOARD OF TECHNICAL EXAMINATIONS, GOA STATE

(1002) Engg. Mathematics I

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	—	—	100

Lectures per week (hrs): 5

Practicals per week (hrs): NIL

Course Credits 4

Theory Marks: 100

(One paper 3 hrs)

Prog. Ass. Marks: 25

Rationale: This preliminary course is aimed at providing knowledge and developing cognitive skills, computational skills, and mathematical reasoning thus enabling the students to cope with future courses. Since the course is a basic for Engineering Course, it is suggested that examples from the various fields of engineering may be incorporated.

Sr. No.	Course Content	Hrs.	Marks
I	<u>Coordinate Geometry</u>	20	25
	1.1 Introduction		
	1.2 Distance and section formula		
	1.3 Area of a triangle		
	1.4 Various forms of the equation of a straight line		
	1.5 Distance of a point from a straight line.		
	1.6 Angle between two straight lines – conditions for lines to be parallel or perpendicular.		
	1.7 Various forms of the equation of a circle		
	1.8 Equations of tangent and normal to the circle at the point of Contact.		
II	<u>Trigonometry</u>	20	20
	(Simple problems based on direct application of the formulae only to be asked)		
	2.1 Definition of a radian – relation between degree and radian- Length of an arc and Area of a sector		
	2.2 Trigonometric ratio for any angle.		
	2.3 Trigonometric Identities.		
	2.4 Trigonometric Ratios of allied angles, compound angles and multiple angles (2A only)		
	2.5 Sum or difference form		
	(Problems based on trigonometric ratios of numerical angles should be omitted. Eg. Show, that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$)		
	2.6 Product formulae.		
	2.7 Sine Rule, Cosine Rule, Tangent Rule		
	2.8 Solutions of triangles		
III	<u>Limits and functions</u>	13	15
	3.1 Idea of function (no question to be asked)		
	3.2 Types of function (no question to be asked)		

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3.3 Concepts of limits, Limits of

- (i) Algebraic
- (ii) Trigonometric
- (iii) Logarithmic
- (iv) Exponential functions.

(Problems based on algebraic limits and direct application of

$$\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta}, \lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta}, \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \lim_{x \rightarrow 0} \frac{1 - a^x}{x}, \lim_{\alpha \rightarrow 0} (1 + \alpha)^\alpha, \lim_{\theta \rightarrow 0} \left(1 + \frac{1}{n}\right)^\theta$$

only shall be asked. No problems on method of substitution)

IV Differential Calculus

- 4.1 Definition of derivative
- 4.2 Derivative of standard functions (no proofs) (no question to be asked on derivative from first principles)
- 4.3 Derivative of sum, difference product and quotient of a Function.
- 4.4 Derivatives of Composite, Implicit and Parametric function with reference to
 - a) Algebraic
 - b) Logarithmic
 - c) Trigonometric
 - d) Inverse circular functions
- (Direct problems without substitution shall be asked)
- e) Exponential functions
- 4.5 Logarithmic differentiation
- 4.6 Second order derivatives (Definition only)
- (No questions to be asked)

V Applications of Derivatives:

- 5.1 a) Geometrical Meaning of the Derivative
- b) Equations of tangent and normal to curves
- 5.2 a) Derivative as a rate – measure
- b) Meaning of velocity, acceleration.
- c) Rates and motion.
- 5.3 Maxima and Minima.

Total 80 100

Instruction to Paper-Setters/Model Question Paper:-

i) The question paper will consist of 5 questions

ii) Question I will carry 20 marks and is compulsory. This should cover the entire syllabus.

This can be of one of the following types.

a) 10 questions from the entire syllabus carrying 2 marks each

b) part (A) 4 questions of 3 marks each and part (B) 4 question of 2 marks each

(c) Part (A) 4 questions of 3 marks each and part (B) 2 questions of 4 marks each

(iii) Question II to question V will have sub – 5 questions of 5 marks each (can be two questions of 2 and 3 marks each) and the student will be required to attempt any 4 sub – questions. The pattern of the questions from II to V should be as follows.

Q (II)

i) 1.1, 1.2, 1.3-----5 marks

ii) 1.4 -----5 marks

iii) 1.5, 1.6 -----5 marks

iv) 1.7-----5 marks

v) 1.8-----5 marks

Q(IV)

i) 3.3 (ii) -----5 marks

ii) 3.3 (iii), (iv) -----5 marks

iii) 4.4 (composite functions) -----5 marks

iv) 4.4 (implicit function)----- 5 marks

v) 4.4 (parametric function)----- 5 marks

Q (III)

i) 2.2, 2.3 -----5 marks

ii) 2.4, 2.5, 2.6 -----5 marks

iii) 2.7-----5 marks

iv) 2.8----- 5 marks

v) 3.3 (i)-----5 marks

Q(V)

i) 4.1, 4.2, 4.3, 4.4 -----5 marks

ii) 4.5-----5 marks

iii) 5.1-----5 marks

iv) 5.2-----5 marks

v) 5.3-----5 marks

Reference Books:- i) Mathematics for Polytechnic students by S. P. Deashpande Vol. I
 ii) Mathematics for Polytechnic students by S. P. Deashpande Vol. II
 iii) Mathematics for Polytechnic students by T.T.T.I. Vol. I, II (Bhopal)
 iv) Mathematics for Polytechnic by Manjit Singh.