NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF BUILT ENVIRONMENT

DEPARTMENT ARCHITECTURE

STRUCTURAL DESIGN I

AAR2105

Examination Paper

December 2017

This examination paper consists of 9 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: GRAPH PAPER

Examiner's Name: Eng. V.V.DESAI

INSTRUCTIONS

1. Answer all questions
2. Use of calculators is permissible

MARK ALLOCATION

QUESTION	MARKS
1.	**25**
2.	**25**
3.	**25**
4.	**25**
TOTAL	**100**

QUESTION ONE

Describe the following:

a. Limit States (5)
b. Characteristic Load (5)
c. Partial Safety factors (5)
d. Ultimate Design Load (5)
e. Limit State Design (5)

QUESTION TWO

A simply supported reinforced concrete slab spans 5.0m.

Design a suitable slab using Grade 25 concrete and high yield reinforcement to support the following characteristic loads:

Imposed load 4.0kN/m^2

Finishes 0.5kN/m^2

QUESTION THREE

a. Explain why timber element design is based on Elastic Theory. (6)
b. Distinguish between grade stress and permissible stress (6)
c. What are modification factors and why are they used in design. (13)

QUESTION FOUR

A flat roof spanning 4.25m is to be designed using timber joists at 600mm centres. The load from the proposed roof construction is as follows:

Dead load 1.0kN/m^2

Imposed load 0.3kN/m^2

Determine the size of suitable SC3 joist

Grade Stress for SC3 timber:

Bending stress parallel to grain 5.3N/mm^2

Modulus of elasticity E_{min} = 5800N/mm^2

Select appropriate modification factors

K_1 = 1.0; K_2 =1.0; K_3 =1.0; K_8 =1.1

K_7

For h = 200mm is 1.046

h = 225mm is 1.032

h = 250mm is 1.20

