

**MASINDE MULIRO UNIVERSITY OF SCIENCE AND
TECHNOLOGY
(MMUST)
UNIVERSITY EXAMINATIONS**

2013/2014 ACADEMIC YEAR.

**FIFTH YEAR FIRST SEMESTER EXAMINATIONS
FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL AND
STRUCTURAL ENGINEERING**

COURSE CODE: CSE 511

COURSE TITLE: DESIGN OF LOW RISE BUILDINGS

DATE:

DURATION: 4 HOURS

INSTRUCTIONS TO CANDIDATES:

Answer question ONE (compulsory) and One question from section B.

Marks for each question are indicated in the parenthesis.

Standard codes and manuals relevant to the subject are allowed.

The usual notations apply.

SECTION A

Question one(40 marks) –(compulsory)

- Explain preliminary data required in design of low rise buildings.(6 marks)
- Discuss the objectives of site investigations (6 marks)
- Outline structural design process (4 marks)
- Illustrate the meaning of structural idealization (4 marks)
- Discuss causes of structural failure (10 Marks)
- Arrangement of portal frames and a section through an industrial building is shown in figure 1(a) and 1(b) respectively. The frames are at 7.2m centres and the length of the building is 72m. Determine the critical wind loading per unit length acting on the slanting sides of the edge frame given the following basic data. (10 Marks)

Basic data

- Total length : $b = 72\text{m}$
- Spacing: $s = 7.20$
- Bay width: $d = 30\text{m}$
- Height (max): $h = 7.3\text{ m}$
- Roof slope: $\alpha = 5^\circ$
- Critical wind direction, $\theta=90^\circ$
- The building is 100km from the sea and constructed in town
- Altitude factor, $S_a= 1$
- Directional factor, $S_d= 1$
- Seasonal factor, $S_s= 1$
- Probability factor, $S_p= 1$
- Basic wind speed= 18m/s

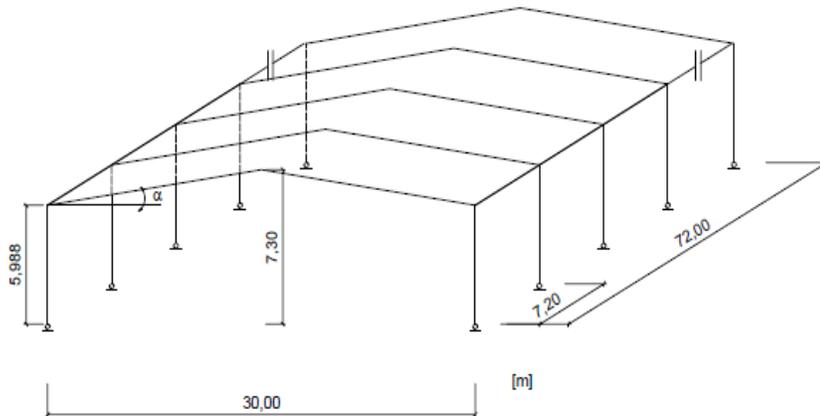


Figure 1(a): Portal frames Arrangement of an Industrial building

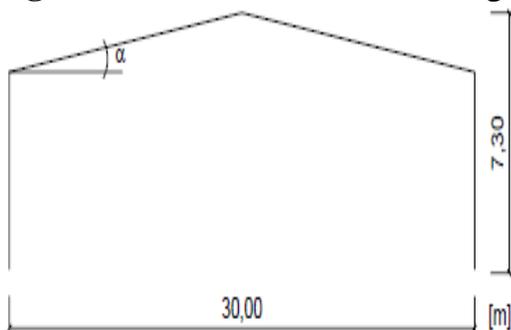


Figure 1(b): Industrial building section

SECTION B-(Answer one question in this section)

Question two (30 marks)

A simply supported reinforced concrete beam supports ultimate design load of 64.0 kN/m. Using the data given determine:

- a) Required beam reinforcement, and
- b) Sketch typical reinforcement arrangements indicating the curtailment and anchorage of steel at the support.

Design data

Exposure condition –mild

Characteristic strength of concrete f_{cu} - 40N/mm²

Characteristic strength of main reinforcement f_y - 460N/mm²

Characteristic strength of shear reinforcement f_{yv} - 460N/mm²

Nominal maximum aggregate size h_{agg} -20mm

Minimum required fire resistance- 1.0 hour

Effective span of the beam- 8.0m

Question three (30 marks)

- a) Select a suitable UB section to function as a simply supported beam carrying a 140mm thick solid concrete slab together with an imposed load of 7.0kN/m². Beam span is 7.2m and beams are spaced at 3.6 m intervals. Due to restraint from slab there is no possibility of lateral-torsional buckling, design the beam for:
 - i) Moment capacity
 - ii) Shear capacity
 - iii) Deflection limit
- b) For the same loading and support conditions of question 3(a) select a suitable UB assuming that the member must be designed as laterally unrestrained.