TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 13M)

EBC 2307: STRUCTURAL STEEL & TIMBER DESIGN

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions
All questions carry equal marks
Maximum marks for each part of a question are as shown
Use neat, large and well labeled diagrams where required.

This paper consists of **THREE** printed pages

Question

a) State advantages of structural steel over reinforced concrete. **(5 marks)**

b) Figure 1 shows a stanchion eccentrically loaded supporting an axial load of 120KN from upper floors. In addition it supports a total uniformly distributed load of 80KN over an entire span of 4.0m. The actual length is 5.0m and is fully fixed at both ends. Select a suitable u.c. section and check its adequacy. **(15 marks)**

Plan

Question Two

a) State FOUR methods of grading structural timber. **(8 marks)**

b) Timber joists spaced at 1.5m centres are supported on 200mm thick coral block walls over a clear span of 3.5m. Select a suitable section to satisfy bending requirements and check for:

(i) Shear
(ii) Deflection **(12 marks)**

Data:

- Permissible bending stress = 8.5N/mm^2
- Permissible shear stress = 1.2N/mm
- Permissible deflection = span/300
- Medium term load duration
- Etimber = 10KN/mm^2

Question Three

a) State advantages of bolted and welded connections **(6 marks)**

b) A U.B section of span 5.0m is supported onto u.c. sections at both ends by 15mm thick angle cleats distributed load of 25KN/m over the entire span. Select a suitable U.B section for bending requirement and check for:

(i) Shear
(ii) Deflection
(iii) Web buckling
(iv) Web crushing **(14 marks)**

Question Four

Figure 2 shows a U.B section supporting a uniformly distributed load of 20KN/m over the entire length.

a) Select a suitable U.B section for bending requirements
b) Check for:
   (i) Web buckling at support B
   (ii) Bearing at support A
   (iii) Deflection between A and B **(12 marks)**

Data:

- Permissible shear stress = 115N/mm^2
- Permissible bending stress = 165N/mm^2
- Permissible deflection = span/360

20mm thick angle cleat

Question Five

a) Illustrate diagrammatically conditions of end restraint of stanchions. **(6 marks)**

b) An axially loaded stanchion of actual length 4.0m supports load of 450KN. The stanchion is fully fixed at both ends.
   (i) Select a suitable u.c. section and check its adequacy
   (ii) Design stanchion base **(14 marks)**

Data:

- $P_{cc} = 5.3N/mm^2$
- $P_{bct} = 185N/mm^2$