PROGRAM	: B.TECH *CIVIL ENGINEERING*
SUBJECT	: **STRUCTURAL STEEL DESIGN IV**
CODE	: **TSR411**
DATE	: WINTER SSA EXAMINATION 2015 15 JULY 2015
DURATION	: (SESSION 1) 08:00 - 12:00
WEIGHT	: 40 : 60
TOTAL MARKS	: 96

EXAMINER	: MR C BRUWER
MODERATOR	: MR. B. RAATH
NUMBER OF PAGES	: 2 PAGES

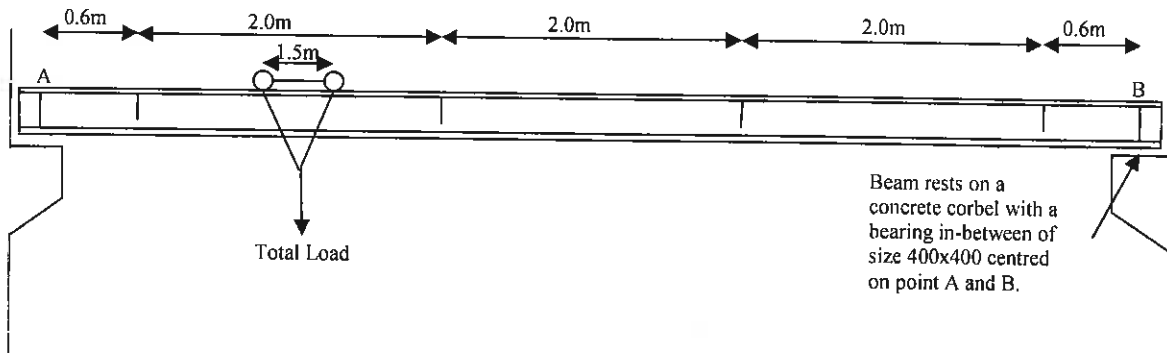|	
INSTRUCTIONS	: THIS IS A PARTLY OPEN BOOK EXAMINATION. : PLEASE ANSWER ALL THE QUESTIONS
REQUIREMENTS	: PROGRAMABLE POCKET CALCULATORS ALLOWED.

___

QUESTION 1

Check if a 1640 x 400 (12W, 35F) (Grade 350W) plate girder beam is adequate to support the moveable crane load.

Crane Load:

- The two point loads, at each wheel of the trolley, is acting on the bottom flange of the beam as indicated in the sketch below. The total load to be suspended by the beam is as follow:
  - o 200 kN (Nominal Dead)
  - o 1580 kN (Nominal Live)
- UDL (A-B)
  - o Consider the own weight of the beam

a. Determine the maximum bending moment for the beam when the crane load is at center of beam
b. Determine the maximum shear force diagram for the beam when the one wheel of the crane load is almost on the support.
c. Determine if the beam is adequate to resist the maximum applied bending moment.
d. Determine if web stiffeners are required to resist the maximum applied shear force and if the suggested web stiffeners are effective.
   Determine if the suggested bearing stiffener (Grade 350W) at the support is adequate to support the maximum reaction force.
e. Determine if the suggested intermediate web stiffeners (Grade 350W) is adequate to resist the maximum shear force.

(71)

Total Load

Beam rests on a concrete corbel with a bearing in-between of size 400x400 centred on point A and B.

Notes: Take the steel grade as 345 MPa if a member exceed 16mm thickness.
          Try bearing stiffener size as a pair of 140x12mm with 10mm chamfer
          The length if the intermediate bearing plate is 70mm
          Try intermediate stiffener size as a pair of 60x8mm

QUESTION 2

Check if a 305 x 165 x 40 (Grade 350W) composite beam propped during construction, with an 80mm thick concrete slab is adequate to support the nominal loadings as indicated below.

(25)

Permanently applied loads:
- Steel deck 0.2 kN/m^2
- Permanent live load 6 kN/m^2
- Include the own weight of the steel beam

Notes:
The concrete slab, 80mm thick, is flat (no ribs) and is constructed using 30 MPa concrete.
The composite steel beam spans 7m and is simply supported on both ends.
Use 70% of the horizontal force for partial shear connection.
Use 16mm diameter shear studs on a bottomed composite deck
The composite beams are spaced at 4m center to center.
Check only for flexure and horizontal shear (shear stud sizing and spacing). Do not check for vertical shear.

TOTAL : 96