



PROGRAM : BENGTECH
CIVIL ENGINEERING

SUBJECT : PRE-STRESSED CONCRETE DESIGN

CODE : PSCC1B3

DATE : SUMMER SUPPLEMENTARY EXAMINATION
NOVEMBER 2019

DURATION : XXX

WEIGHT : 40 : 60

TOTAL MARKS : 100

EXAMINER : MR GD ROBERTS Sanso Number

MODERATOR : XXX File Number

NUMBER OF PAGES : 4 PAGES

INSTRUCTIONS : QUESTION PAPERS MUST BE HANDED IN.

REQUIREMENTS : NA.

INSTRUCTIONS TO CANDIDATES:

PLEASE ANSWER ALL THE QUESTIONS.

QUESTION 1

- a) Name all forms of prestress losses. (3)
- b) List the factors influencing deflections. (3)
- c) Define pre-stressed concrete. State advantages as over reinforced concrete. (3)
- d) Distinguish between pre-tensioning and post-tensioning. (3)
- e) Describe the difference between using the methods of lumped losses Vs time step losses. (3)
- f) Define Bursting tension. (3)
- g) What are the advantages of pre-stressed concrete construction? (2)

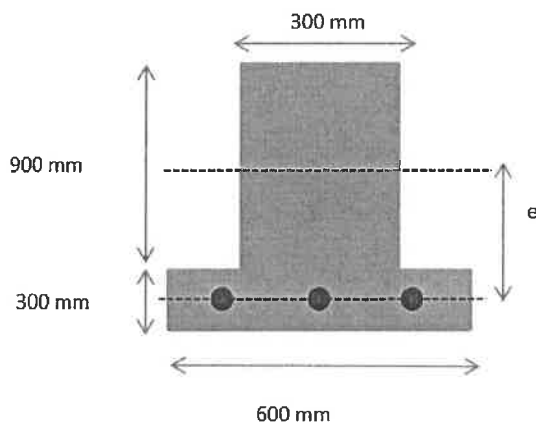
QUESTION 2

A pre-stressed concrete beam of inverted T-beam as shown in the figure below and is simply supported over a span of 16 m.

The beam is post-tensioned with 3 cables, each containing 12 wires of 7 mm diameter placed as shown at the mid span. If the initial pre-stress is 1000 MPa per cable.

Calculate maximum uniformly distributed load if the maximum compressive stress in concrete is limited to 14 MPa and tensile stress is limited to 1 MPa.

Assume loss of pre-stress as 15%.



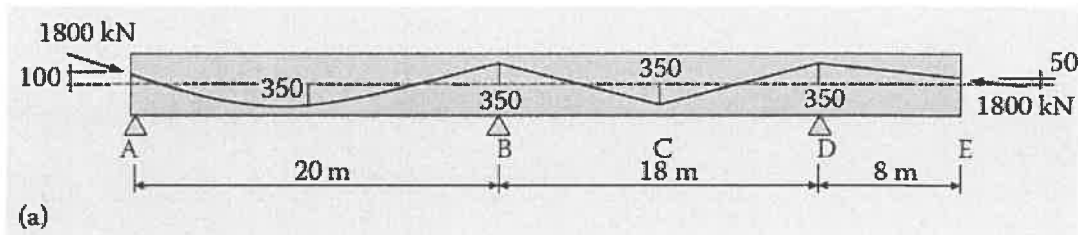
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QUESTION 3

The continuous beam shown in the Figure below has a rectangular cross-section 400 mm wide and 900 mm deep.

If the pre-stressing force is assumed to be constant along the length of the beam and equal to 1800 kN, calculate the bending moment and shear force diagrams induced by pre-stress.

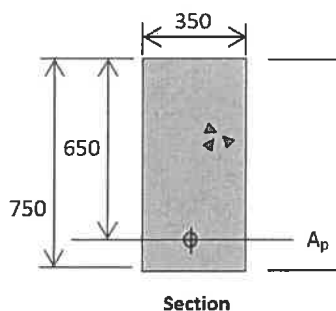


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QUESTION 4

The design flexural resistance M_R of the rectangular section of the Figure below is to be calculated.

- $A_p = 1000 \text{ mm}^2$
- $f_{pu} = 1860 \text{ MPa}$
- $f_{se} = 1391 \text{ MPa}$
- $f_{cu} = 40 \text{ MPa}$
- $E_p = 195 \text{ GPa}$
- $E_c = 35 \text{ GPa}$
- $\epsilon_{cu} = 0.0035$
- $\alpha = 0.45$
- $\beta = 0.9$



(20)

QUESTION 5

The 9 m simply-supported beam is rectangular in cross section carrying UDL as follows:

- Permanent load = 5 kN/m (excluding self-weight)
- Variable load = 20 kN/m
- Losses are to be 25%
- Permissible tensile stresses are 2.5 MPa at transfer and 2.0 MPa in service;
- Permissible compressive stresses are 20 MPa at transfer and at service:

Determine an appropriate rectangular section for the member taking the density of pre-stressed concrete to be 24 kN/m³.

(20)