

ENGINEERING TRIPOS PART IIB 2009

4D10 STRUCTURAL STEELWORK

1a) Moment to be carried at midspan is 1262 kNm; moment capacity of floor is 1313 kNm.

1b) Axial force in concrete is 4047 kN. Use 174 shear studs over entire span.

1c) Imposed short term deflection is 39.2mm; limit on deflection is 56 mm.

2b) (i) Axial capacity without bracing is 213.4 kN. (ii) Axial capacity with bracing is 623.4 kN, giving 2.92 fold increase over (i). (iii) Intermediate bracing stiffness required is 259 kN/m.

3a) Critical LTB moment is 80.4 kNm, stability governs.

3b) $\beta = -0.5$, and critical LTB moment is 201.0 kNm, which governs over strength.

4a) Critical moment capacity, after subtraction of compressive core, is 148.0 kNm.

4b) Interaction equation approach gives maximum moment in strength as 288.3 kNm and a maximum moment for stability as 32.2 kNm, which governs.

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