

ENGINEERING TRIPOS PART IIA 2011

**NUMERICAL ANSWERS
MODULE 3D3: STRUCTURAL MATERIALS & DESIGN**

- 1 (b) i) 203x102x23 UB; 406x178x54 UB
iii) 203x203x46 UC
- 2 (b) i) M20 bolts are adequate, but beam web has insufficient bearing capacity and requires strengthening with 4.7mm thick steel plate.
ii) 6mm
(c) 1636kN
- 3 (a) Max BM = 201.5kNm, Max SF = 115.2kN.
(b) 3T25 bottom reinforcement at mid span, 2T25 bottom reinforcement at supports.
(c) 120mm
- 4 (b) i) 220.6mm
ii) 1x20mm diameter bolt.