2012-GATE-EE-40-52

EE24BTECH11028 - Jadhav Rajesh

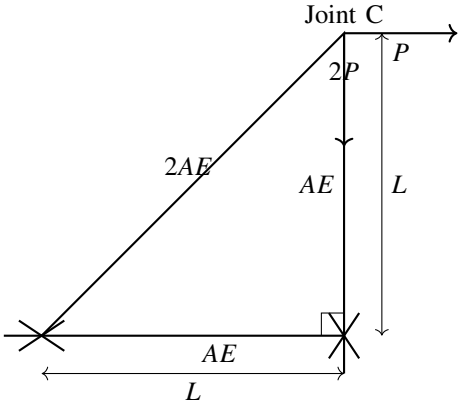
1) An RCC short column (*withlateralties*) of rectangular cross section of $250mm * 300mm$ is reinforced with four numbers of $16mm$ diameter longitudinal bars. The grades of steel and concrete are $Fe415$ and $M20$,respectively. Neglect eccentricity effect. Considering limit state of collapse i compression ($IS\,456:2000$),the axial load carrying capacity of the column ($inkN, uptoonedecimalplace$),is

2) An RCC beam of rectangular cross section has factored shear of $200kN$ at its critical section. Its width b is $250mm$ and effective depth d is $350mm$.Assume design shear strength τ_c of concrete as $0.62N/mm^2$ and maximum allowable shear stress $\tau_{c,max}$ in concrete as $2.8N/mm^2$.If two legged $10mm$ diameter vertical stirrup of $Fe250$ grade steel are used, then the required spacing ($incm, uptoonedecimalplace$) as per limit state method will be

3) the dimensions of a symmetrical welded I-section are shown in the figure.

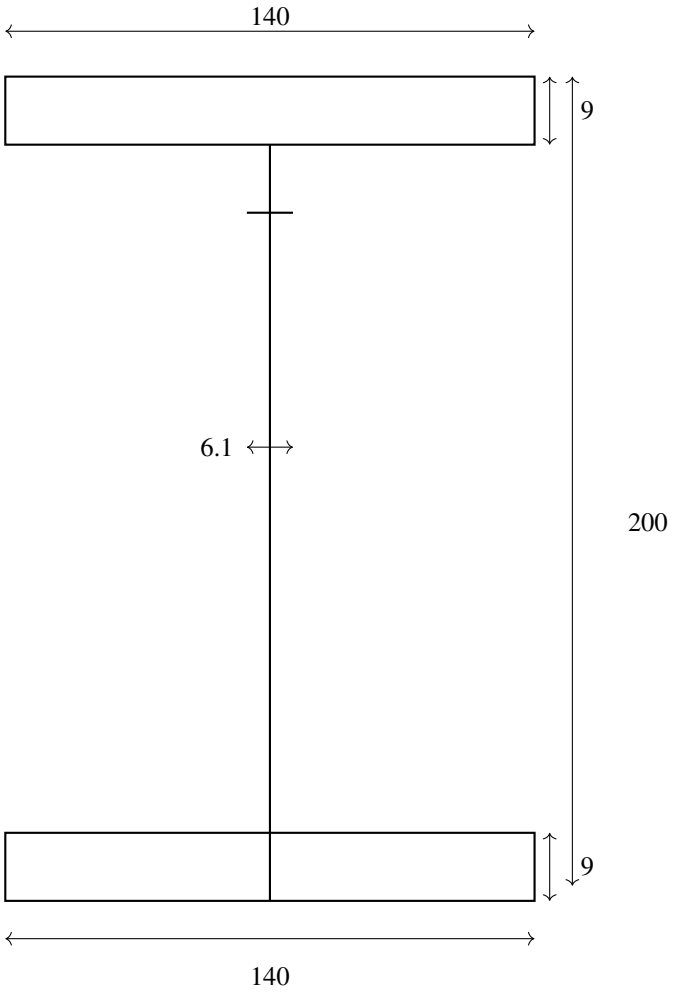
   The plastic section modulus about the weaker axis ($incm\text{-}uptoonedecimalplace$) is

4) consider the deformable pin-joined truss with loading,geometry and section properties as shown in figure.



   Given that $E = 2 * 10^{11} N/m^2, A = 10mm^2, L = 1m$ and $p = 1kN$.The horizontal displacement of joint C ($inmm, uptoonedecimalplace$) is

5) The water level in the the adjacent river is at an elevation of $+20.0m$.Unit weight is $10kN/m^3$.The factor of safety ($uptotwodecimalplaces$) against sand boiling for the proposed excavation is



(All dimensions are in mm)

6) A conventional drained triaxial compression test was conducted on a normally consolidates clay sample under an effective pressure of $200kPa$.the deviator stress at failure was found to be $400kPa$. An identical specimen of the same clay sample is isotropically consolidated to a confining pressure of $200kPa$ and subjected to standard undrained triaxial compression test. If the deviator stress at failure is $150kPa$, the pore pressure developed ($inkPa, uptoonedecimalplace$) is.

7) The void ratio of a soil is 0.55 at an effective normal stress of $140kPa$.The compression index of the soil is 0.25.In order to reduce the void ratio to 0.4, an

increase in the magnitude of effective normal stress ($inkPa, uptoonedecimalplace$) should be.

8) A rigid smooth retaining wall of height $7m$ with vertical backface retains saturated day as backfil. the saturated unit weight and undrained cohesion of the backfill are $17.2kN/m^3$ and $20kPa$, respectively.The difference in the active lateral forces on the wall ($inkNpermeterlenghtofwall, uptorwodecimalplace$),before and after the occurrence of tension crack is.

9) Rainfall depth over a watershed is monitored through six number of well distributed rain gauges. Gauges date are given below

Rain Gauge Number	1	2	3	4	5	6
Rainfall Depth (mm)	470	465	435	525	480	510
Area of Thiessen Polygon ($\times 10^4$ **m**^{2})	95	100	98	80	85	92

The Thiessen mean value ($inmm, uotoonedecimalplace$) of the rainfall is

10) The infiltration rate f in a basin under ponding condition is given by $f = 30 + 10e^{-2t}$, where, f is in mm/h and t is time in hour. The depth of infiltration ($inmm, uptoonedecimalplace$) during the last 20 minute of a storm of 30 minute duration is

11) In a laboratory, a flow experiment is performed over a hydraulic structure.The measured value of discharge and velocity are $0.05m^3/s$, and $0.25m/s$, respectively.If the full scale structure ($30timesbigger$) is subjected to a discharge of $270m^3/s$ then the time scale ($modetofullscale$) value ($uptotwodecimalplaces$) is

12) A water sample analysis data is given below
The carbonate hardness ($expressedasmg/LofCaCO_3, uptoonedecimalplace$) for

Ion	**Concentration, mg/L**	**Atomic Weight**
Ca^{2+}	60	40
Mg^{2+}	30	24.31
HCO_3^-	400	61

the water sample is

13) ultimate BOD (L_0) of a wastewater sample is estimated as 87% of COD. The COD of this wastewater is $300mg/L$. considering first order BOD reaction rate constant k ($inmg/L, uptoonedecimalplace$) after three days of incubation at 27% for this wastewater will be.