Upload Tugas ke-5

TUGAS-5

MEKANIKA TERAPAN (MTS 271201)

Oleh :

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Dosen Program **: Dr. Firdaus, ST., M.T**

PROGRAM PASCASARJANA MAGISTER TEKNIK SIPIL

UNIVERSITAS BINA DARMA

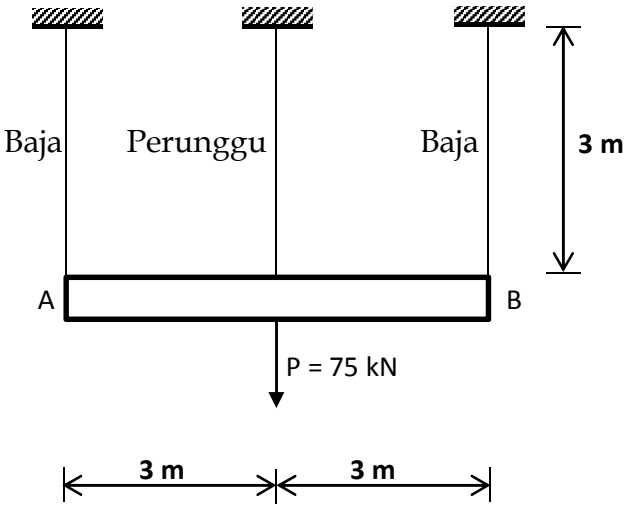
2020

Tugas-5

Sebuah batang kaku AB digantung pada kawat vertical dari bahan perunggu dan baja seperti

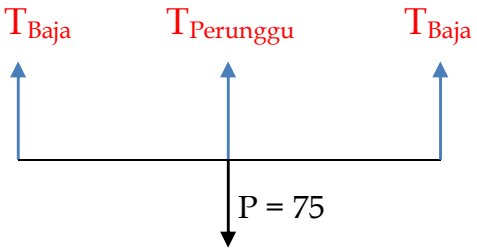
tergambar. Kawat ini memikul beban P yang berkerja di titik tengah batang. Hitunglah deformasi

dan tegangan pada kawat tersebut.



	Baja	**Perunggu**
Diameter (mm)	16	22
E (GPa)	200	100

Jawab :



$$\sum V = 0$$

$$T_{Baja} + T_{Perunggu} + T_{Baja} = P$$

$$2T_{Baja} + T_{Perunggu} = 75\ kN$$

$$A_{Baja} = \frac{1}{4}\pi\left(d_{Baja}\right)^2 = \frac{1}{4}\pi(16\ mm)^2 = 201\ mm^2$$

$$A_{Perunggu} = \frac{1}{4}\pi\left(d_{perunggu}\right)^2 = \frac{1}{4}\pi(22\ mm)^2 = 380{,}1\ mm^2$$

$$\delta_{baja} = \left(\frac{T.L}{A.E}\right)_{baja}$$

$$T_{baja} = \left(\frac{A.E.\delta}{L}\right)_{baja} = \frac{201\ \cancel{mm^2}.\ 200.10^3\ \frac{N}{\cancel{mm^2}}\ .\delta}{3000\ mm} = 13400\ \delta\ \frac{N}{mm}$$

$$\delta_{perunggu} = \left(\frac{T.L}{A.E}\right)_{perunggu}$$

$$T_{perunggu} = \left(\frac{A.E.\delta}{L}\right)_{perunggu} = \frac{380{,}1\ \cancel{mm^2}.\ 100.10^3\ \frac{N}{\cancel{mm^2}}\ .\delta}{3000\ mm} = 12670\ \delta\ \frac{N}{mm}$$

$$2T_{Baja} + T_{Perunggu} = 75\ kN$$

$$2.\left(13400\ \delta\ \frac{N}{mm}\right) + 12670\ \delta\ \frac{N}{mm} = 75.10^3\ N$$

$$39470\ \delta\ \frac{N}{mm} = 75000\ N \rightarrow \delta = \frac{75000}{39470} mm = 1{,}9\ mm$$

$$\sigma_{baja} = \frac{T_{baja}}{A_{baja}} = \frac{13400\ \delta\ \frac{N}{mm}}{201\ mm^2} = \frac{13400\ \frac{N}{\cancel{mm}}\ x\ 1{,}9\ \cancel{mm}}{201\ mm^2} = 126{,}7\frac{N}{mm^2} = 126{,}7\ MPa$$

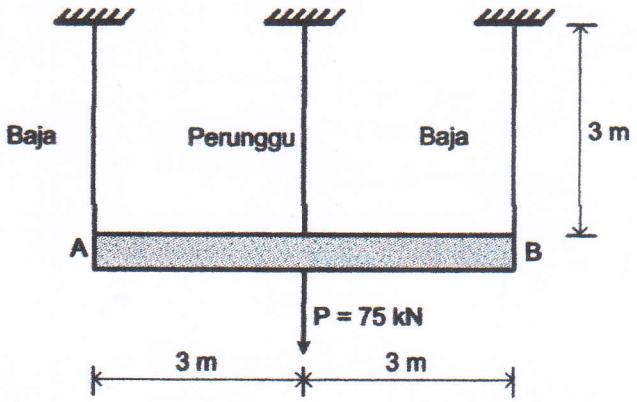
$$\sigma_{perunggu} = \frac{T_{perunggu}}{A_{perunggu}} = \frac{12670\ \delta\ \frac{N}{mm}}{380{,}1\ mm^2} = \frac{12670\ \frac{N}{\cancel{mm}}\ x\ 1{,}9\ \cancel{mm}}{380{,}1\ mm^2} = 63{,}3\frac{N}{mm^2} = 63{,}3\ MPa$$

Universitas Bina Darma

Nama Mahasiswa	:	Agus Rudiyanto/ 192710046/ MTS4
Mata Kuliah	:	MEKANIKA TERAPAN (MTS271201)
Dosen	:	Dr. Firdaus, M.T.
Tugas	:	EL. 05

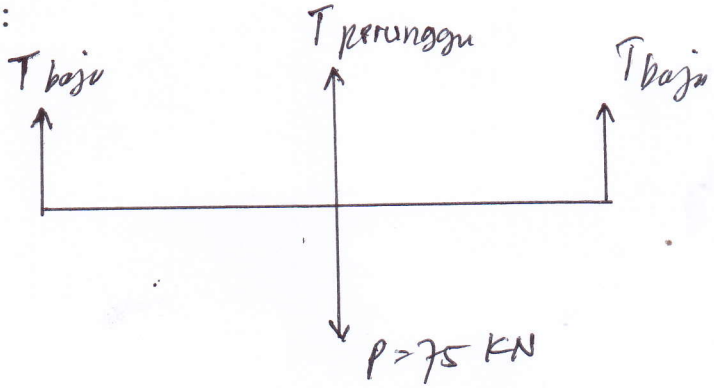
Tugas-7

Sebuah batang kaku AB digantung pada kawat vertical dari bahan perunggu dan baja seperti tergambar. Kawat ini memikul beban P yang berkerja di titik tengah batang. Hitunglah deformasi dan tegangan pada kawat tersebut.



	Baja	Perunggu
Diameter (mm)	16	22
E (GPa)	200	100

Jawab :



$\Sigma V = 0$

$T_{baja} + T_{perunggu} + T_{baja} = P$

$2T_{baja} + T_{perunggu} = 75\,kN$

* $A_{baja} = \frac{1}{4}\pi D^2 = \frac{1}{4}\pi . 16^2 = 200.96\ mm^2$
* $A_{perunggu} = \frac{1}{4}\pi D^2 = \frac{1}{4}\pi . 22^2 = 379.94\ mm^2$

* $\delta_{baja} = \left(\frac{T \cdot L}{A E}\right)_{baja}$

$T_{baja} = \frac{\delta \cdot A \cdot E}{L} = \frac{\delta \cdot 200.96 \cdot 200.10^3}{3000} = 13397{,}333\,\delta$

* $\delta_{perunggu} = \left(\frac{T \cdot L}{A \cdot E}\right)_{perunggu}$

$T_{perunggu} = \frac{\delta \cdot A \cdot E}{L} = \frac{\delta \cdot 375.94 \cdot 100.10^3}{3000} = 12.664{,}7\,\delta$

$2T_{baja} + T_{perunggu} = 75\,kN$

$2(13.397{,}333\delta) + 12.664.7\,\delta = 75..60^3\,N$

$\delta = 1{,}9\,mm$

$\sigma_{baja} = \frac{T_{baja}}{A_{baja}} = \frac{13.397{,}333 \cdot 1{,}9}{200.96} = 126{,}67\,MPa$ //