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Vehicle Technology (M4X00394)

Examination answers

Examination date: 14/5/2020

Start time: 13:00



Question 2

Question 2

i. $\frac{AV^2}{r} = \mu a$

$\frac{25^2}{130} = \mu a = 4.81 \text{ m/s}^2$

2

ii. Load transfer = $\frac{mah}{T}$

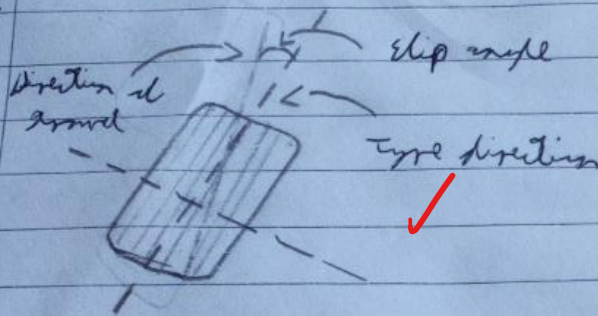
$\frac{915 \times 4.81 \times 0.375}{1.16} = 1422.79 \text{ N}$

3

iii. When load is transferred from one tyre to another, the one with the highest load will have more grip than the other. However if the load is too high, then that tyre ~~may~~ ^{will} start to lose its grip. Therefore too much weight transfer can negatively affect overall grip.

2

iv.



The slip angle is the angle between the direction forced by the tyre and the actual direction of travel.

X direction the wheel is pointing and actual heading.

Question 3

Question 3

i. $\frac{1}{K} = \left(\frac{1}{K_1} + \frac{1}{K_2} \right)$

$\frac{1}{K} = \left(\frac{1}{13,000} + \frac{1}{28,000} \right) = 1.27 \times 10^{-4}$ accuracy.

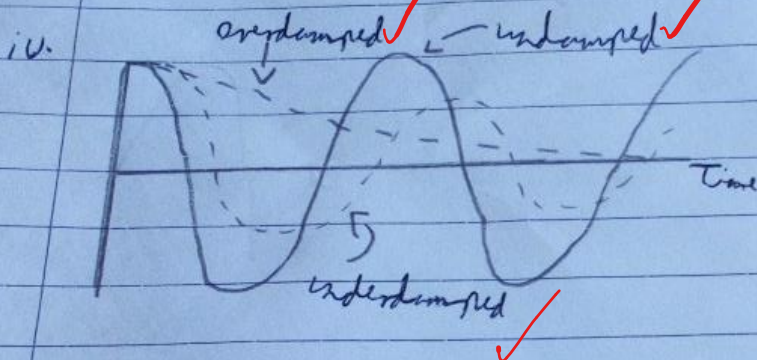
$K = \frac{1}{1.27 \times 10^{-4}} = 7874.02 \text{ N/m}$ 2

$K_{\text{total}} = 7874.02 \times 2 = 15748.04 \text{ N/m}$

ii. Natural frequency $= \frac{1}{2\pi} \sqrt{\frac{K}{m}}$ error.

$\frac{1}{2\pi} \sqrt{\frac{15748.04}{215}} = 8.85 \text{ Hz} \rightarrow 1.36 \text{ Hz}$

iii. A lower natural frequency like this would result in a better ride for the vehicle which is preferable for all road vehicles considering the harsh terrain that they are expected to cover. 1



3

Question 4

Answer 4

i. $F = ma$

$F = 875 \times 7.5 = 6562.5 \text{ N}$ ✓

ii

Question 5

Question 5

i.

ii. Total demand = $1115 + 1485 = 2600 \text{ N}$ ✓ 1
 $2600 = C_L \times \frac{1}{2} \times 1.223 \times (35)^2 \times 1.1$ ✓ 2
 $C_L = \frac{2600}{824} = 3.16$ ✓

iii. ^{working?} $0.67 \times 824 = 552.08 \text{ N}$ ✓ 1

iv. $\frac{1115}{2600} \times 100 = 42.89\%$ ✓ 2