Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	MECHATRONIC MECHANISM
COURSE CODE	:	BEH 41103
PROGRAMME	:	4 BEJ
EXAMINATION DATE	:	DECEMBER 2014 / JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Explain briefly gear and belt condition and give five (5) advantages and disadvantages.

(12 marks)

(b) Give two (2) condition of a mass body in order to completely balance.

(4 marks)

(c) Classify the static regions of motion transition in dry friction.

(6 marks)

(d) Explain what are (i) Free vibration.

(ii) Undamped vibration

(iii) Damped vibration.

(3 marks)

Q2 A three-stage displacement-type telescopic cylinder is used to tilt the body of a lorry as in Figure Q2. When the lorry is fully loaded, the cylinder has to exert a force equivalent to 4000 kg at all points in its stroke. The outside diameters of the tubes forming the three stages are 60, 80 and 100 mm. If the pump powering the cylinder delivers 10 liter per minute (LPM).

(a) Calculate the extend speed of each stage of the cylinder when tilting a fully loaded lorry.

(13 marks)

(b) Determine the required pressure for each stage of the cylinder when tilting a fully loaded lorry.

(12 marks)

Q3 Synthesize the effect of the body pivoted from O or A to natural frequency of a compound pendulum as shown in Figure Q3. OA is the pendulum length, B is the middle point of OA, G is the point between pivoted point and end point of pendulum, d is the length between pivoted point and G point, and θ is an angular displacement of the pendulum.

(25 marks)

Q4 The slider-crank mechanism as shown in Figure Q4 has the dimensions: AB = 1 m and BC = 1 m. When the link 1 rotates at an angle $\phi = \phi_1 = \pi/6$ rad along the horizontal axis the instantaneous speed and the angular acceleration of the link 1 are $\omega = 1$ rad/s and $\alpha = -1$ rad/s^2.

Calculate:

(i) Velocities of the joint.

(7 marks)

(ii) Accelerations of the joint.

(6 marks)

(iii) Angular velocities of the link.

(6 marks)

(iv) Accelerations of the link.

(6 marks)

- END OF QUESTION –

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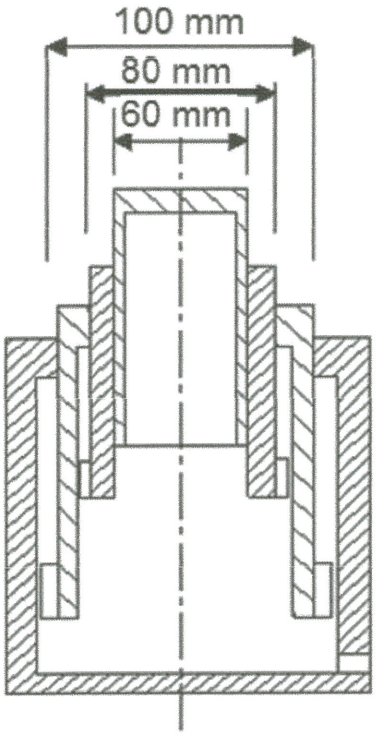

FIGURE Q2

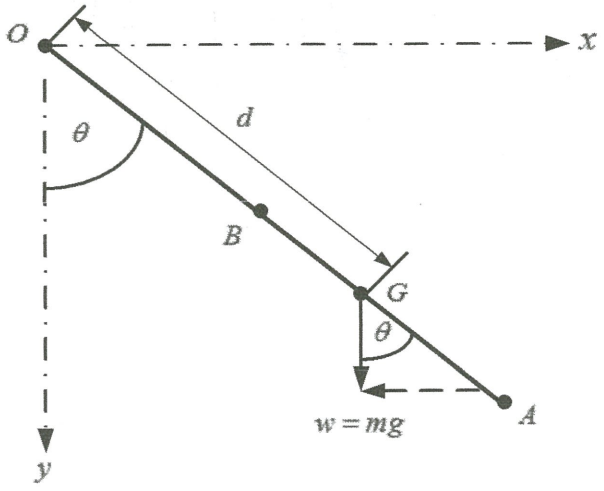

FIGURE Q3

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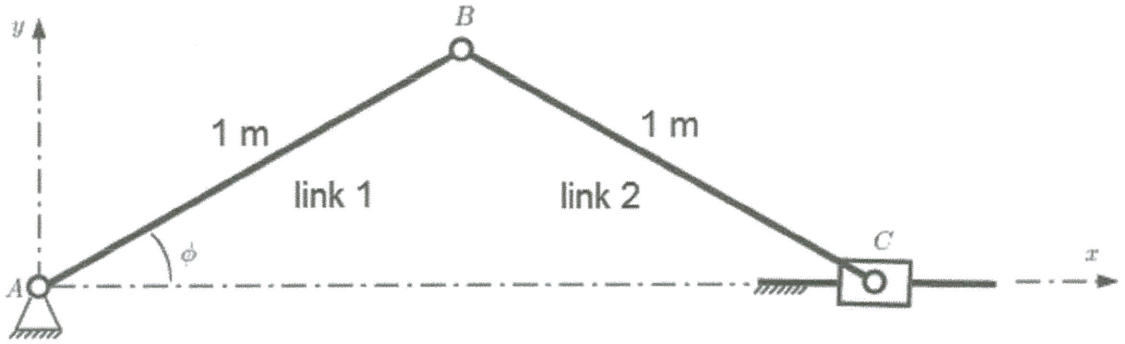

FIGURE Q4