Major Test, MEL 211 Kinematics & Dynamics Of Machines; Sem I: 2008-09

PART II

Attempt all questions:

Q1. Set up a higher order polynomial function for the follower displacement y as a function of θ to satisfy the following conditions at the beginning and end of rise.

$y = 0$; $\dot{y} = 0$ and $\ddot{y} = 0$ at $\theta = 0$ and $y = L$; $\dot{y} = 0$ and $\ddot{y} = 0$ at $\theta = \beta$ (10)

Q2. Consider the 4 stroke 4 cylinder engines with firing orders I-II-III-IV and I-II-IV-III.

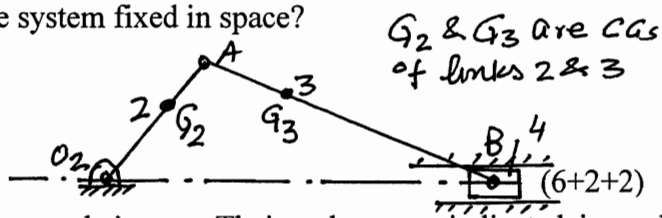
(i)Check the balance condition (primary& secondary forces&moments) for both engines.

(ii)What is the difference in the balance condition of two engines? Which firing order will you prefer from the point of view of balancing? (5+5)

Q3. Consider a slider crank mechanism shown in figure. Show how you can modify the mechanism to make the CG of the system fixed in space?

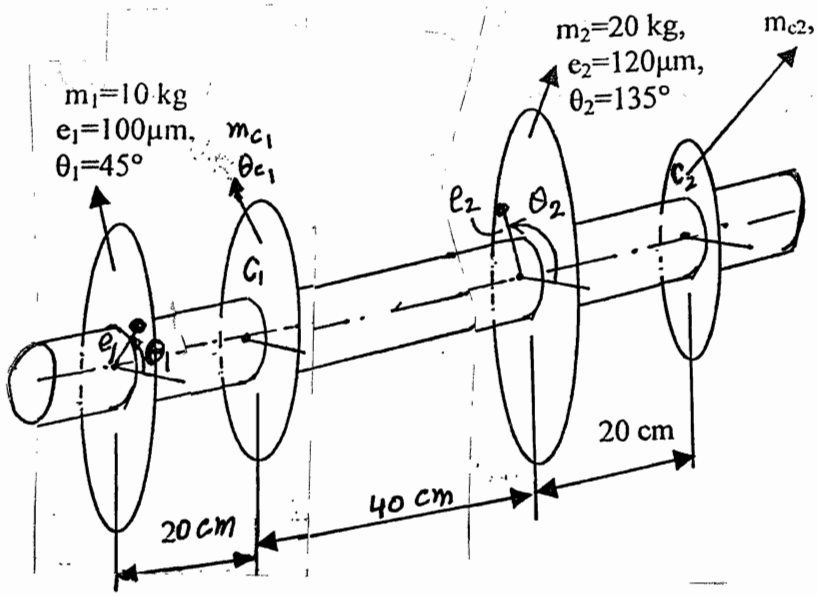
What is the significance of fixing the CG of a mechanism in space?

Would you consider it as complete balance of the mechanism?



(6+2+2)

Q4. Figure shows a rotor with two unbalances. Their values are indicated in each plane. Angular position of unbalance is measured in clockwise sense from the horizontal. Determine the correction masses and their angular positions (from horizontal) that are required to be placed in the two correction planes (c_1 and c_2) at a radius of 20 cm. (10)



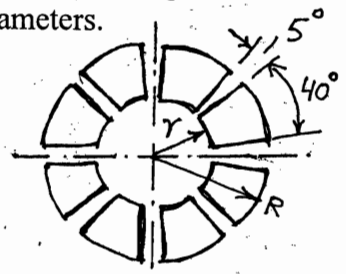
Q5. The runner of a vertical thrust pad schematically shown in figure is supported by 8 sector shaped thrust pads. Assume the bearing to be operating under the condition of maximum load carrying capacity with following parameters. (10)

R/r = 3; speed = 500 RPM ;

Total load = 250 N ; viscosity = 0.02 Pa s.

Find the outside diameter (R) of the bearing if the permissible minimum film thickness is to be 0.03 mm.

Also determine the power loss in the bearing.



Q6. Consider a full film long journal bearing with following specifications.

Length of bearing = 6 cm; radius of the journal = 3 cm; radial clearance = 0.06 mm;

Viscosity of oil = 30 cp; rotational speed = 500 RPM.

If the bearing operates at an eccentricity ratio of 0.6, determine,

(i) Load bearing capacity (ii) friction coefficient of the bearing (iii) power loss in the