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B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2017
THEORY OF MACHINES
(Mechatronics)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   (a)   Define the following terms:
          (i) Lower and higher pair.   (ii) Closed and open pair.
          (iii) Constrained motion.   (iv) Inversion and mechanism and explain with an example.
    (b)   Discuss in details about different spring loaded Governors with examples and neat sketches.

2   (a)   How are Whitworth quick – return mechanism and crank and slotted – lever mechanism are different from each other?
    (b)   Discuss in detail about inversions of single slider mechanism with examples and neat sketches.

3   (a)   Discuss in detail about Pantograph and Robert mechanisms with examples and neat sketches.
    (b)   Write in detail about straight line motion mechanisms of type Scott Russell, Watt and Peaucellier with examples and neat sketches.

4   (a)   Explain determination of velocity and acceleration diagrams of single slider crank mechanism using relative velocity and instantaneous methods by taking suitable example.
    (b)   In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 radians per second clockwise. Lengths of the links are AB = 60 mm; BC = CD = 70 mm; DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD, find the angular velocities (magnitude and direction) of BC and CD; and angular acceleration of BC and CD.

5   (a)   Hook's joint connects two shafts intersecting at 150°. The driving shaft rotates at 120 rpm. The driven shaft operates against a steady torque of 150 NM and carries a flywheel of mass 45 kg and radius of gyration 15 cm. What is the maximum torque which must be exerted by driving shaft?
    (b)   What are different types of steering gear mechanisms? Show that Davis steering gear mechanism provides correct steering.

6   (a)   A flat-ended valve tapped is operated by a symmetrical cam with circular arcs for flank and nose profiles. The total angle of action is 150°, base circle diameter 125 mm and the lift 25 mm. During the lift, the period of acceleration is half that of the declaration. Speed of cam shift is 1250 rpm. The straight line path of the tapper passes through the cam axis.
          Find: (i) Radii of the nose and the flank.
                (ii) Maximum acceleration and deceleration during the lift.
    (b)   Write in detail about different types of followers and also different motions of followers and cams.

7   (a)   What is meant by interference in involute gears? Explain in detail with an example.
    (b)   The centre distance between two meshing spiral gears is 150 mm and the angle between the shafts 60°. The gear ratio is 2 and the normal circular pitch 10 mm. The driven gear has a helix angle of 25°, determine: (i) The number of teeth on each wheel.
                (ii) The exact centre distance.
                (iii) The efficiency if the friction angle is 4°.

8   (a)   Discuss in detail about procedure for selection of gear box.
    (b)   Explain the procedure to analyze an epicyclic great train.
    (c)   What do you mean by a compound epicyclic gear?