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Total No.of Pages:02

**BTECH(ME),MAY –2014**  
**THEORY OF MACHINES I**  
**Paper Code (ME-203)**  
**Paper Id. [A0802]**

Time Allowed: 03 Hours

Max. Marks: 60

**Note: Section A is compulsory. Answer any four questions from section B. Answer any two questions from section C. Assume any missing data suitably.**

**Section A**

1. (i) Define rolling pair with an example.  
(ii) What is meant by stepped pulley?  
(iii) What are the advantages of a rope drive over a belt drive?  
(iv) Write the application areas of cams?  
(v) Where do we need idle pulleys?  
(vi) What are the purposes of using a dynamometer?  
(vii) What are the purposes of using a governor?  
(viii) Define power of a governor.  
(ix) What are the main differences between Ackerman and Davis steering mechanisms?  
(x) What is meant by hunting of governors?

(2 x 10 = 20 Marks)

**Section B**

2. Draw and explain three inversions of a quadric cycle chain.
3. Draw and explain the steering gear mechanism. Also derive the condition for no skidding of wheels during turning.
4. Explain the analytical method used for designing the cam profile with SHM.
5. Discuss the working of the Hart mechanism using a neat sketch.

6. Draw and explain the working of absorption and transmission type dynamometers.

(5x4 = 20 Marks)

### Section C

7. Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap  $160^\circ$  and maximum tension in the belt is 2500 N.
8. A three cylinder single acting engine has its cranks set equally at  $120^\circ$  and it runs at 600 r.p.m. The torque-crank angle diagram for each cycle is a triangle for the power stroke with a maximum torque of 90 N-m at  $60^\circ$  from dead centre of corresponding crank. The torque on the return stroke is sensibly zero. Determine power developed. Also find coefficient of fluctuation of speed, if the mass of the flywheel is 12 kg and has a radius of gyration of 80 mm, Also find coefficient of fluctuation of energy and maximum angular acceleration of the flywheel.
9. A Hartnell governor having a central sleeve spring and two right-angled bell crank levers moves between 290 r.p.m. and 310 r.p.m. for a sleeve lift of 15 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis and mass of each ball is 2.5 kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine the loads on the spring at the lowest and the highest equilibrium speeds, and stiffness of the spring.

(10 x 2 = 20 Marks)

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