5E3179

B.Tech. (Sem.V) (Main/Back) Exam Dec. 2012
Mechanical Engineering
5ME5 Dynamics of Machines

[Time : 3 Hours]

[Total Marks : 80]
[Min. Passing Marks : 24]

Instructions to Candidates :

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Unit - I

1. (a) What are centrifugal governor? How do they differ from inertia governors? (4)
   (b) What do you mean by effort and power of a governor? Find expressions for same in a porter governor. (4+8)

   OR

1. (a) What is the function of a governor? How does it differ from that of a flywheel. (4)
   (b) Derive an expression for height of governor of watt governor with considering mass of arm. (12)

Unit - II

2. (a) Explain in what way that gyroscopic couple affects the motion of an aircraft while taking a turn. (8)
   (b) Derive an expression for the angular acceleration of the connecting rod of a reciprocating engine. (8)

   OR

2. The torque delivered by a two stroke engine is represented by $T = (1000 + 300 \sin 2\theta - 500 \cos 2\theta)$ Nm where θ is angle turned by the crank from inner dead centre. Engine speed is 250 rpm. The mass of flywheel is 400 kg and radius of gyration 400 mm. Determine.
   (i) Power developed.
   (ii) Percentage fluctuation of speed.
   (iii) Angular acceleration of flywheel when crank has rotated through an angle 60° from IDC.
   (iv) Maximum angular acceleration and retardation. (16)

Unit - III

3. (a) What do you mean by undercutting of gears? (4)
   (b) Define terms related to worm and worm gears: Axial Pitch and lead. (4)
   (c) Derive a relation for a minimum number of teeth for rack and pinion arrangement to avoid interference. (8)

   OR

3. (a) Make a comparison of cycloidal and involute tooth forms. (4)
   (b) Two 20° involute spur gears mesh extremely and give a velocity ratio of 3. Module is 3 mm and addendum is equal to 1.1 module. If the pinion rotates at 120 rpm, determine
   (i) The minimum number of teeth on each wheel to avoid interference.
   (ii) The number of pairs of teeth in contact. (12)

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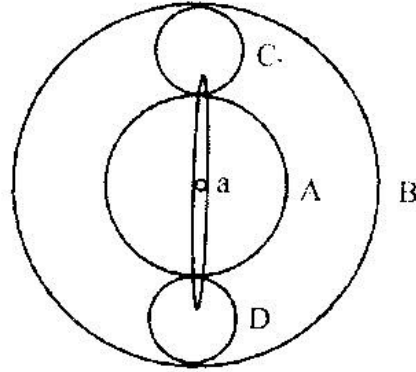
Unit - IV

4. (a) Define velocity ratio and transmission ratio. **(4)**
   (b) An epicyclic gear train is shown in fig., the number of teeth on A and B are 80 and 200. Determine the speed of the arm "a".
   (i) If A rotates at 100 rpm clockwise and B at 50 rpm counter clockwise.
   (ii) If A rotates at 100 rpm clockwise and B is Stationary. **(12)**

OR

4. (a) Explain the working of constant mesh gear box. **(8)**
   (b) Give the procedure to analyse sun and planet gear train. **(8)**

Unit - V

5. (a) Deduce expressions for variation in tractive force, swaying couple and hammer blow for an uncoupled two cylinder locomotive engine. **(8)**
   (b) Describe any one type of static balancing machine. **(8)**

OR

5. (a) Why is balancing necessary for rotors of high speed engines? **(4)**
   (b) Three masses of 8 kg, 12 kg and 15 kg, attached at radial distances of 80 mm, 100 mm, and 60 mm respectively to a disc in a shaft are in complete balance. Determine the angular positions of the masses 12 kg and 15 kg relative to 8 kg mass. **(12)**