JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I SEMESTER EXAMINATIONS, APRIL/MAY-2012
GEAR ENGINEERING
(MACHINE DESIGN)

Time: 3hours   Max.Marks:60

Answer any five questions
All questions carry equal marks
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1.a)   Describe method used to calculate the dynamic load on gears using M.F. spots
         equation of mechanics.
  b)   Design a spur gear drive to transmit 22KW at 900rpm, speed reduction is 2.5
         materials for pinion and wheel are C15 steel and cast iron grade 30^0 respectively.
         Take pressure angle of 20^0 and working life of the spur gears as 10,000 hrs.

2.a)   What is meant by equivalent spur gear?
  b)   A pair of helical gears have 20^0 stub teeth in diameters plane and helix angle is
         45^0. The power to be transmitted is 20KW. The pinion rotates at 5000rpm and
         has 30teeth.The gear ratio is 5. The material for gears is steel with safe bending
         stress of 110MPa. Design A helical gear system with suitable assumed data.

3.a)   Why is the center distance an important parameter in the design of worm and
         worm gear?
  b)   A worm drive transmits 15KW at 2000rpm to a machine carriage at 75rpm. The
         worm is triple threaded and has 65mm pitch diameter. The worm gear has 90
         teeth of 6mm module. The tooth form is to be 20^0 full depth involute. The
         coefficient of friction between the rating teeth may be taken as 0.1 calculate.
          (i) Tangential force acting on the worm.
          (ii) Axial thrust and separating force on worm
          (iii) Efficiency of the worm drive.

4.a)   Explain the tooth forces in bevel gears and their significance in the selection of
          bearing and design of shaft.
  b)   Face width is 1/3rd of slant length. Velocity factor is $\dfrac{3.5}{3.5\sqrt{V}}$. Find modulate,

         face width, pinion chic, gear die. Check the design for dynamic load and wear.
         C = 300KN/m. If the mean plan of the gear is 120mm from the left hand bearing,
         determine the forces on the bearings and estimate the diameter of the shaft.

5.a)   What are the different types problems faced while using gears? Explain them
         briefly.
  b)   What is Gear noise? How it effects the gear system?

6. Design the layout of a gear box for a milling machine to provide is twelve output speeds ranging from 160 rpm to 2000rpm. Input speed 1440 rpm. Choose standard speed ratio and construct the structural diagram and kinematic arrangement. Show the number of teeth for all the gears in the kinematic arrangement.

7.a) Explain the method of conjugate auxiliary fractions in gear trains.

 b) A compound epicyclical gear train is as shown in fig. The gears A, D and E are free to rotate on the axis P. The compound gear B and C rotate together on the axis Q at the end of arm F. All the gears have equal module. The number of teeth on the gears A, B and C are 18, 45 and 21 respectively. The gears D and E are annular gears. The gear A rotates at 120 rpm ccw and the gear D rotates at 450 rpm cw. Find the speed and direction of the arm and the gear E.
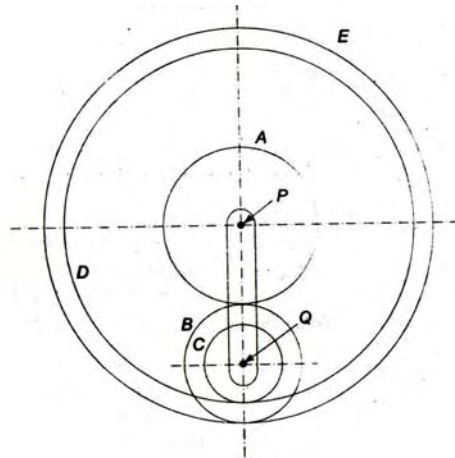
8.a) What are the applications of traditional and non traditional optimization techniques.

 b) Formulate the Gear train problem in which number of teeths of gear are assumed to be known and face width of gears are assumed as decision variables. Take minimization of total weight of gear train as objective.

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