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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2017

Mechanical Engineering
(Machine Design)

01ME6112: Design of Power Transmission Elements

Max. Marks: 60   Duration: 3 Hours

Instructions: Answer **any two questions** from each part
                          Use of **data book** is permitted

Part A

1) a) How are wire ropes classified?   **(2 Marks)**

   b) Design a V belt drive for the following specifications.
Power to be transmitted	= 7.5 kW
Speed of driving wheel	= 1440 rpm
Speed of driven wheel	= 400 rpm
Diameter of driving wheel	= 300 mm
Centre distance	= 1000 mm
Service	= 16 hours / day

   (7 Marks)

2) a) Explain various stresses that are acting on a belt drive?   **(2 Marks)**

   b) Design a wire rope for an elevator in a building 60 m height and for a total load of 20 kN. The speed of elevator is 4 m/s and full speed is reached in 10 seconds.   **(7 Marks)**

3) A clutch has 3 discs on the driving shaft and 2 discs on the driven shaft. The outer diameter of the contact surface is 240mm and inner diameter is 120mm. Assuming uniform pressure distribution, find the total spring load pressing the plates together to transmit 20kW at 1440 rpm. Assume co-efficient of friction as 0.3. Find the total spring load and uniform pressure.

   (9 Marks)

Part B

4) a) Identify the diameter of shaft subjected to bending moment.   **(2 Marks)**

   b) Design a shaft to transmit 40 hp at 1200 rpm from a motor. The shaft is fitted on two bearings located 6m apart. Two pulleys A & B of diameters 350 mm and 500 mm are fitted on the shaft. The position of pulley A is 2.5 m to the right of left hand bearing and transmits maximum of 25 hp. The other pulley is located 2 m to the right pulley A and it transmits the remaining power at an angle of 60° with the drive from pulley A. Assume co-efficient of friction = 0.3 and $\theta = 180^0$.   **(7 Marks)**

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5) Design a spur gear of two shafts transmitting 30 kW power at 3000 rpm of the driver. The total number of teeth on the driving gear is 30 and that of driven is 90. The tooth system is 20° involute and the diameter is made of casi iron and pinion is made of C40 steel. **(9 Marks)**

6) a) Explain law of gearing. **(2 Marks)**

b) Design a helical gear to transmit 25 hp at 1440 rpm of the pinion. The gear ratio is 1:3, helix angle 25° and having full depth tooth system. Pinion is having 24 teeth and is made of steel and gear is made of CI grade 25. **(7 Marks)**

Part C

7) A hardened worm rotates at 1440 rpm and transmits 12 kW to a phosphorous bronze gear. The speed of the worm wheel should be 60 ± 3% rpm. Design the worm gear drive if an efficiency of at least 82% is desired. **(12 Marks)**

8) A nine speed gear box used as a head stock gear box of a turret late is to provide a speed range of 180 rpm to 1800 rpm. Using standard step ratio draw the ray diagram and kinematic layout. Also find the number of teeth on all gears. **(12 Marks)**

9) a) With a neat sketch explain the working of a constant mesh gear box. **(6 Marks)**

b) A sliding mesh gear box is to be used for 4 forward and 1 reverse speeds. First gear speed ratio is 5.5 and reverse gear speed ratio is 5.8. Clutch gear on clutch shaft and gear (in constant mesh) on lay shaft has speed ratio of 2. Calculate the number of teeth on all gears. Assume that the minimum number of teeth on any gear should not be less than 18. Calculate the actual gear ratios. **(6 Marks)**