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Total Number of Pages:

M.TECH
MDPE202

2nd Sem Regular / Back Examination – 2015-16

MECHANICAL DRIVES

Q.CODE:W937

Time: 3 Hours

Max marks: 70

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

Q1 Answer the following questions: (2 x 10)

- a) State and explain the law of gearing.
- b) State the two most important reasons for adopting involute curves for a gear tooth profile.
- c) Discuss the function of a coupling. Give at least three practical applications.
- d) What is a herringbone gear? Where they are used?
- e) In what way a mechanism differ from a machine?
- f) What are the various forces acting on a bevel gear?
- g) Though cone clutches provides high frictional torque, yet they have become obsolete. Why?
- h) What is brake? What is the difference between a brake and a clutch?
- i) What is meant by self-locking and self-energised brake?
- j) Define the following terms used in worm gearing :
(i) Lead; (ii) Lead angle; (iii) Normal pitch; and (iv) Helix angle.

Q2 a) Explain the working of a multi-plate clutch with the help of a neat sketch. (5)

- b) A multi-plate disc clutch transmits 55kw of power at 1800 rpm. Co-efficient of friction for the friction surfaces is 0.1. Axial intensity of pressure is not to exceed 160 kN/mm². The internal radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque. (5)

Q3 a) How are the gears classified? Discuss their applications (5)

- b) The following particulars of a single reduction spur gear are given : (5)
Gear ratio = 10 : 1; Distance between centres = 660 mm approximately;
Pinion transmits 500 kW at 1800 r.p.m.; Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5°; Permissible normal pressure between teeth = 175 N per mm of width. Find :

- i. The nearest standard module if no interference is to occur.
- ii. The number of teeth on each wheel.
- iii. The load on the bearings of the wheels due to power transmitted.

Q4 Describe the working of a band and block brake with the help of a neat sketch .Deduce the relation for ratio of tight and slack side tensions. (10)

Q5 a) Explain the working of a cone clutch with the help of a neat sketch. (5)

b) The angle between two meshing spiral gears is 90° and centre distance is 150 mm approximately. The normal circular pitch of the gears is 10 mm and the gear ratio is 2.5. The frictional angle is 6° and efficiency of the drive is maximum. Determine: (5)

- i. The spiral angles of the teeth.
- ii. The circular pitches of the gears .
- iii. The number of teeth on each wheel.

Q6 Describe, with the help of neat sketches, the types of various shaft couplings mentioning the uses of each type. (10)

Q7 a) An universal coupling is used to connect two mild steel shafts transmitting a torque of 5000 N-m. Assuming that the shafts are subjected to torsion only, find the diameter of the shafts and pins. The allowable shear stresses for the shaft and pin may be taken as 60 MPa and 28 MPa respectively. (5)

b) A worm drive transmits 15 kW at 2000 r.p.m. to a machine carriage at 75 r.p.m. The worm is triple threaded and has 65 mm pitch diameter. The worm gear has 90 teeth of 6 mm module. The tooth form is to be 20° full depth involute. The coefficient of friction between the mating teeth may be taken as 0.10. Calculate : i. tangential force acting on the worm ; ii. axial thrust and separating force on worm; and iii. efficiency of the worm drive. (5)

Q8 Write short notes on the followings: (5 x 2)

- a) Prime mover
- b) Internal expanding brake
- c) Cycloid and involutes
- d) Whitworth quick return motion mechanism