ME – 802 BE. VIII Semester Examination, June 2015

Machine Design

Time: Three Hours   Maximum Marks: 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Use of Design Data Book is permitted.

iv) Assume data suitably, if any missing.

1. a)   Compare belt drive, chain drive and rope drive for power transmission.

b)   Derive an expression for power rating of a V-belt drive.

OR

2. An 8* 19 (9/9/1) steel wire rope is used to lift a load of 10 kN . from a depth of 1000 m. The maximum speed of rope is

2 m/sec and acceleration is 1.5 m/sec2 when starting under no slack condition. Find the size of rope requires.

3. a)   Write a note on interference in gears.

b) Determine the module and face width of a helical gear tooth for a helical gear pair to transmit a power of 20 kW from a shaft rotating at a speed of 1200 rpm to a parallel shaft to be 360 rpm maintaining a centre distances of 180 mm.

OR

4. A pair of bevel gear is required to transmit 25 kW at 450 rpm. The output shaft is running at 200 rpm and is at right angles to input shaft. The gears are of 20° involutes stub teeth. The pinion is cast steel; the safe static strength is 142 MPa. The gear is of cast iron, whose static strength is 71 MPa. Design the gear drive.

5. a)   State the functions of a piston and piston rings.

b)   Give desigfi Step¥'f6r crank shaft with formula used.

OR

6. Determine the principal dimensfons of cylinder for a vertical four stroke compression engine from the following data:

Brake power   :   5 kW

Speed   :   1000 rpm

Indicated mean effective pressure   :   0.35 MPa

Mechanical efficiency   :   85%

7. A long lap-welded steel tube, 8-in. OD, is to with stand an external pressure of 120 psi. with N = 5.

a)   What should be the thickness of the wall of the tube?

b)   What is the ratio D/t? Is it within the range of the Stewart equation?

OR

8. Design a cast irori protected flange coupling to connect two shafts of 36 mm diameter transmitting 25 kW at 950 rpm. The overload capacity is 1.3 times the average torque. The bolts and keys are made of C 20 steel and flanges are made of -FG250.

9. a)   State the classification of optimi2ation techniques. State their application area.

b)   Discuss about the Exhaustive search method.

OR

10.   Write short note on following (Any two):

i)   Engineering applications of optimization.

ii)   Single Vs multi variable optimization problems.

iii)   Lagrange Multipliers method.