

B.E. (Mechanical Engineering) Model Curriculum Semester-VIII  
**PCC-ME-405 - Design of Mechanical Drives**

P. Pages : 2

Time : Three Hours



**GUG/W/24/14370**

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.
  5. Use of Drawing Instruments, Non Programmable Electronic Calculator is allowed.
  6. Use of Design data book is permitted.
  7. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.

1. a) Design a bushed-pin type flexible coupling to connect a pump shaft to motor shaft transmitting 25 kW at 1000 rpm. The overall torque is 20% more than the mean torque. The material properties are as follows: **16**
- i) The allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively.
  - ii) The allowable shear stress for C.I. is 15 MPa.
  - iii) The allowable bearing pressure for rubber bush is 1 MPa.
  - iv) The material of pin is same as that of the shaft and key.
- b) State and explain the application of Flywheel. **4**

**OR**

2. a) Design a flywheel for single cylinder four stroke I.C. Engine developing the power of 60 kW at 1160 rpm. The work done during the power stroke is 1.35 times the work done during the whole cycle. The coefficient of steadiness is 10. **16**
- b) List the important physical characteristics of a good bearing material. **4**
3. a) A V belt transmits 12 kW at 960 rpm of the smaller sheave (pulley). The pitch diameters of pulleys are 173 mm and 346 mm. The center distance is 750 mm. Determine: **10**
- i) Belt section designation (Grade of belt)
  - ii) Number of V belts required for the drive.
- b) Two parallel shaft whose centre lines are 4.8 m apart, are connected by an open belt drive. **10**
- The diameter of the larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the belt when stationary is 3 kN. The mass of the belt is 1.5 Kg/m length. The coefficient of friction between the belt and the pulley is 0.3, Taking centrifugal tension into account, calculate the power transmitted, when the smaller pulley rotates at 400 rpm.

**OR**

4. Design a chain drive to transmit 7 kW power between two line shaft. The driving shaft rotates at 900 rpm and driven shaft rotates at 300 rpm. The drive is supposed to operate for 16 hrs/day. **20**
5. Design the 20° full depth teeth of a pair of spur gears to transmit a smooth continuous load of 22 kW at 1500 rpm. The drive should be as compact as possible with a speed reduction of 3:1. The gear and pinion are made of steel with proper heat treatment. Specify the heat treatment. **20**

**OR**

6. Design a worm gear speed reducer to transmit 22.5 kW at 1440 rpm. The desired speed ratio is 24:1 and efficiency is 85%. Assume that worm is made of hardened steel and gear of phosphor bronze. **20**
7. a) Design the cone clutch to transmit the power of 12 kW at 900 rpm between two shafts the drive is operating for 8 hrs/day. **12**
- b) Compare single plate clutch with multiple plate clutch. List at least two practical applications of each. **4**
- c) Explain the construction of wire rope. What wire rope of (7X20) designates. **4**

**OR**

8. a) Design a suitable wire rope for elevator in a building 160 m high to lift a total weight of 32 kN. The desired speed of elevator is 5.5 m/sec and full speed must be reached in 7.5 second. Also design a drum and sheave. **12**
- b) Explain centrifugal clutch and explain how frictional torque is produced? **4**
- c) State various types of brakes. Also state their advantages & application. **4**

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