

Design of Mechanical Drives

P. Pages : 2

NIR/KW/18/3560/3606

Time : Three Hours



Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Assume suitable data whenever necessary.
 7. Illustrate your answers whenever necessary with the help of neat sketches.
 8. Use of non programmable calculator is permitted.

1. a) Design a protective type of rigid coupling of cast iron for a steel shaft transmitting 15kW at 200 rpm. The maximum torque is 25% greater than full load torque. The shear Strength of C.I. is 14 N/mm^2 , for design purpose. Also take allowable shear stress for shaft material as 40 N/mm^2 . **10**
- b) Design a flywheel for a single cylinder, four stroke diesel engine developing 4kW at 1500 rpm. Assume coefficient of speed fluctuation = 0.01 and coefficient of fluctuation of energy = 2.35. **10**

OR

2. a) A Journal bearing running at 750 rpm is carrying a uniform load of 3000 N. Bearing is operated under ambient temperature at 27°C . Suggest the diameter of bearing and suitable grade of oil if bearing is to have $r/d = 1$. **10**
- b) A single row deep groove ball bearing is subjected to a radial force of 8kW and axial force of 3kW. The shaft rotates at 1200 rpm with light shock. The expected life of bearing is 20,000 hours. The minimum acceptable diameter of shaft is 75mm. Select suitable ball bearing for this application. **10**
3. a) State the advantages and disadvantages of V-belt drive over flat belt drive. **4**
- b) Write short note on factors considered for selection of mechanical drive. **4**
- c) It is required to select a flat belt drive for a compressor running at 720 rpm, which is driven by a 25kW, 1440 rpm electric motor. Space available for center distance is 3m. The belt is open type. **12**

OR

4. a) A 15kW, 960 rpm electric motor drives a line shaft through roller chain The line shaft is running at 240 rpm. The center distance between motor shaft and line shaft is limited to 600 mm. Suggest suitable chain drive. **10**
- b) Design a suitable wire rope for a mine hoist carrying a load of 30kN to be lifted from a depth of 100 meter. A rope speed of 10 m/sec must be attained in 10 seconds. **10**

5. Design a spur gear drive for transmitting 20kW at 1440 rpm to another Shaft running at 400 rpm. The load is medium shock for 8 to 10 hrs per day. The material used is SAE 1045 heat treated for both pinion and gear. Select 20° full depth tooth profile. Also design gear blank. **20**

OR

6. a) What do you mean by formative number of teeth in case of helical gear? **4**
- b) Design a pair of straight teeth cast iron bevel gear to transmit 50kW from a shaft running at 300rpm to another running at 100rpm. check the gears for continuous operation. Assume steady load. The pressure angle is 20° F.D. **16**
7. a) Explain in brief with neat sketch the single and double enveloping worm gears. **4**
- b) Design worm gear drive to transmit 20kW power with medium shock. The speed of worm is 1440 rpm, and the speed of gear is 40 rpm. Also find temperature rise of lubricating oil. **16**

OR

8. a) With neat sketch explain types of piston rings. **4**
- b) A four stroke diesel engine has following specifications. **16**
Brake Power = 5kW ; Speed = 1200 r.p.m ;
Indicated mean effective pressure = 0.35 N/mm²;
Mechanical efficiency = 80%.
Determine :
i) Bore and bore length of cylinder.
ii) Thickness of cylinder head.
iii) Size of stud for cylinder head.
