B.E. Mechanical Engineering (Model Curriculum) Semester-VIII

PCC-ME-405 - Design of Mechanical Drives

P. Pages : 2 **GUG/S/25/14370**

Time : Four Hours * 2 6 2 6 * Max. Marks : 80

Notes :
1. All questions carry equal marks/marks as indicated
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. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
6. Use of Design data book is permitted.

1. a) How does the working of a clamp coupling differ from that of a protected type of rigid flange coupling? Explain. **4**

b) Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15kW at 225 r.p.m. and having an allowable shear stress of 42 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 20% greater than the full load torque. The shear stress for cast iron is 15 MPa. **16**

OR

2. a) Differentiae between Hydrodynamic & Hydrostatic bearings. **4**

b) State various applications of flywheel. What are the stresses induced in the flywheel? **4**

c) A C-I. flywheel running at an average speed of 150 rpm is to store energy 3000 Nm in each revolution with an allowable fluctuation of 20% in the speed. If the diameter of flywheel is limited to 1200 mm, determine rim dimensions and stresses in the flywheel. **12**

3. Design the chain drive to transmit the power of 9kW from electric motor to the line shaft. The electric motor speed is 1200 rpm and the line shaft has to rotate at 400 rpm. This drive is subjected to medium shock load and it is operating for 8 hrs/day. **20**

OR

4. Design flat belt derive to transmit 18kW power between two line shafts. The driving line shaft is rotating at 660 rpm and the driven line shaft is rotating at 220 rpm. The driving line shaft is receiving the power from electric motor through a spur gear drive. This drive is operating for 24 hours per day. It is expected that the belt should have the longer belt life. **20**

5. a) Explain the term bevel factor in case of bevel gears. **4**

b) Design a Helical gear drive with Helix angle of 19º to transmit the power of 18kW from one shaft to another. The driving shaft is rotating at 1200 rpm and driven shaft should rotate at 400 rpm. The drive is operating for 16 hrs/day and it is subjected to moderate shock loads. **16**

OR

6.		A pinion running at 800 rpm transmits 8.5 kW at 300 rpm. to a gear. Design a spur gear drive. Assume material for gear and pinion as SAE 1045, heat treated forged carbon steel. The drive is subjected to moderate shock and working 24 hrs/day. Also design a gear blank for larger gear.	**20**
7.	a)	Explain internally expanding brake and derive the expression to determine the braking torque.	**4**
	b)	Design a wire rope, sheave and drum to hoist the load of 110kN through the height of 40 meters with the velocity of 15 meters per minute. The final velocity should be achieved within 6 seconds.	**16**

OR

8.	a)	Compare single plate clutch with multiple plate clutch. List at least two practical applications of applications of each.	**5**
	b)	Explain centrifugal clutch and explain how frictional torque is product?	**5**
	c)	A centrifugal clutch is to be designed to transmit 14kW at 850 r.p.m. The shoes are four in number. The speed at which the engagement begins is $3/4^{th}$ of the running speed. The inside radius of the pulley rim is 150mm. The shoes are lined with Ferrodo for which the coefficient of friction may be taken as 0.25. Determine: 1. mass of the shoes, and 2. size of the shoes.	**10**

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