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

PCC-ME-405 - Design of Mechanical Drives

P. Pages : 2 **GUG/S/23/14370**

Time : Four Hours * 3 0 5 8 * 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. Diagrams and Chemical equation should be given wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted use of non programmable calculator is permitted.
7. Use of design data book is permitted.
8. Solve Q. 1 or Q.2, Q. 3 or Q.4, Q. 5 or Q.6, Q. 7 or Q. 8.

1. a) State the applications of coupling and flywheel. **4**

b) Design a draw a cast iron protected type flange coupling to connect two shafts of 36mm diameter transmitting 16kW at 700rpm. The overload capacity is 1.2 times the average torque. The following permissible stresses may be used. **16**

Shear stress for shaft, bolt and keys are $60\,N/mm^2$.

Crushing stress is $150\,N/mm^2$

Shear stress for flange is $10\,N/mm^2$

OR

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

b) Design the life of 0412 deep groove ball bearing for 5900N Radial load and 5400N axial load. **16**

3. Design flat belt drive to transmit 15kW power between two line shafts. The driving line shaft is rotating at 750rpm and the driven line shaft is rotating at 250rpm. The driving line shaft is receiving the power from electric motor through a spur gear drive. This drive is operating for 8 hours per day. It is expected that the belt should have the longer belt life. **20**

OR

4. a) State the advantages and disadvantages of V-Belt drive over flat belt drive. **4**

b) Design flat belt drive to transmit 15kW power between two line shafts. The driving line shaft is rotating at 750rpm and the driven line shaft is rotating at 250 rpm. The driving line shaft is receiving the power from electric motor through a spur gear drive. This drive is operating for 8 hours per day. It is expected that the belt should have the longer belt life. **16**

5. Design spur gear drive transmitting 20kW at 1440rpm to another shaft running approximately at 400rpm. The load is medium shock at 8 to 10 hr. Per day. The material used in SAE 1045 heat treated for both pinion and gear. Select 20^o full depth tooth profile. **20**

OR

6. Design of bevel gear drive to transmit the power of 29600W between the two line shaft the driving shaft is rotating at 900rpm and the driven shaft at 300rpm. The drive is subjected to light shock load and is to operate for single shift. **20**

7. a) Explain centrifugal clutch and explain how frictional torque is produced? **4**

b) Compare single plate clutch with multiple plate clutch. **4**

c) A plate clutch having a single driving plate with contact surface on each side is required to transmit 110kW at 1250 r.p.m. The outer diameter of the contact surfaces is to be 300mm. The coefficient of friction is 0.4. **12**

i) Assuming a uniform pressure of 0.17 N/mm2; determine the inner diameter of the friction surfaces.

ii) Assuming the same dimensions and the same total axial thrust, determine the maximum torque that can be transmitted and the maximum intensity of pressure when uniform wear conditions have been reached.

OR

8. a) Explain internally expanding brake and derive the expression to determine the braking. **4**

b) State various types of brakes. Also state their advantages & application. **4**

c) A rope drum of an elevator having 650mm diameter is fitted with a brake drum of 1m diameter. The brake drum is provided with four cast iron brake shoes each subtending an angle of 45º. The mass of the elevator when loaded is 2000kg and moves with a speed of 2.5 m/s. The brake has a sufficient capacity to stop the elevator in 2.75 metres. Assuming the coefficient of friction between the brake drum and shoes as 0.2, find: **12**

i) Width of the shoe, if the allowable pressure on the brake shoe is limited to 0.3 N/mm2; and

ii) Heat generated in stopping the elevator

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