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

P. Pages : 2

Time : Three Hours

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Max. Marks : 80

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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 design data book is permitted.
          7.   Use of non-programmable calculator is permitted.
          8.   Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.

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

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

OR

2. a) State various applications of flywheel.   **4**

     b) Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 18 kW at 200 r.p.m and having an allowable shear stress of 40 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 25% greater than the full load torque. The shear stress for cast iron is 14 MPa.   **16**

3. Desing flat belt drive to transmit 14 kW power between two line shafts. The driving line shaft is rotating at 810 rpm and the driven line shaft is rotating at 270 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.   **20**

OR

4. a) What is 'Chordal action in chain drive?   **4**

     b) The roller chain is to be used in power plant to transmit 180 kW from an engine to generator. Generator speed is 525 rpm, engine speed is 725 rpm. Design a roller chain and sprocket.   **16**

5. A helical gear speed reducer is used to transmit 25 kW from an electric motor running at 1440 rpm to a centrifugal blower running at 300 rpm. The gears are to be hobbed with 20° full depth. The pinion should have 12 teeth. Design a pair of gears for continuous duty. Assume other suitable data.   **20**

OR

6.	a)	State the advantages and disadvantages of worm gear drive.	**4**
	b)	An elevator cage move at a rate of 100m/min. the elevator drum diameter is 600mm and the load to be lifted is 20 kN. The worm gear is driven by electric motor running at 960 rpm. Design worm and worm gear assuming suitable material.	**16**
7.	a)	Compare single plate clutch with multiple plate clutch. List at least two practical applications of applications of each.	**4**
	b)	What are the materials used for lining of friction surfaces in case of friction clutches?	**4**
	c)	A single dry plate clutch is to be designed to transmit 7.5 kW at 900 r.p.m. Find:	**12**

        i)   Diameter of the shaft,
        ii) Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4,
        iii) Outer and inner radii of the clutch plate, and
        iv) Dimensions of the spring, assuming that the number of springs are 6 and spring index = 6. The allowable shear stress for the spring wire may be taken as 420 MPa.

OR

8.	a)	State various types of brakes. Also state their advantages & application.	**4**
	b)	How does the function of a brake differ from that of a clutch?	**4**
	c)	A rope drum of an elevator having 650 mm diameter is fitted with a brake drum of 1 m 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 2000 kg and moves with a speed of 2.5 m/s. The brake has a sufficient capacity to stop the elevator in 2.75 meters. Assuming the coefficient of friction between the brake drum and shoes as 0.2, find: (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.	**12**

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