Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Marine Engg.) (2013 Batch) (Sem.–7)

DESIGN OF MACHINES -II

Subject Code : BTME-601

Paper ID : [74250]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Q1 Answer briefly :

a) List the important factors that influence the magnitude of factor of safety.

b) Enumerate the different types of belt materials used for power transmission.

c) How are ends of belts joined? For horizontal belts which side (tight or slack) of the belt should run on the top and why?

d) Why the face of a pulley is crowned?

e) Under what circumstances a fibre rope and a wire rope is used?

f) What do you understand by simplex chain?

g) Explain why flywheels are used in punching machines.

h) How are the gears classified?

i) In which type of spring the behaviour is non-linear?

j) Why a positive clutch is used?

SECTION-B

Q2 Discuss the functioning and structure of CAD softwares used in design of machine elements.

Q3 Two parallel shafts whose centre lines are 4.8 m apart, are connected by an open belt drive. 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 r.p.m.

Q4 Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 kN/mm^2. Also calculate the maximum shear stress induced.

Q5 An engine developing 45 kW at 1000 r.p.m. is fitted with a cone clutch built inside the flywheel. The cone has a face angle of 12.5° and a maximum mean diameter of 500 mm. The coefficient of friction is 0.2. The normal pressure on the clutch face is not to exceed 0.1 N/mm^2. Determine the face width required, and the axial spring force necessary to engage the clutch.

Q6 Describe the Properties of Lubricants used in transmission systems.

SECTION-C

Q7 A split type flywheel has outside diameter of the rim 1.80 m, inside diameter 1.35 m and the width 300 mm. the two halves of the wheel are connected by four bolts through the hub and near the rim joining the split arms and also by four shrink links on the rim. The speed is 250 r.p.m. and a turning moment of 15kN-m is to be transmitted by the rim. Determine :

a) The diameter of the bolts at the hub and near the rim, σ_{tb} = 35 MPa.

b) The cross-sectional dimensions of the rectangular shrink links at the rim, σ_{tl} = 40 MPa ; w = 1.25 h.

c) The cross-sectional dimensions of the elliptical arms at the hub and rim if the wheel has six arms, σ_{ta} = 15 MPa, minor axis being 0.5 times the major axis and the diameter of shaft being 150 mm.

Assume density of the material of the flywheel as 7200 kg / m^3.

Q8 A helical cast steel gear with 30° helix angle has to transmit 35 kW at 1500 r.p.m. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depth teeth. The static stress for cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. What would be the end thrust on the gear? The tooth factor for 20° full depth involute gear may be taken as

$$0.154 - \frac{0.912}{T_E}$$

Where T_E represents the equivalent number of teeth.

Q9 The block brake, as shown in Figure below, provides a braking torque of 360 N- m. The diameter of the brake drum is 300 mm. The coefficient of friction is 0.3. Find The force (P) to be applied at the end of the lever for the clockwise and counter clockwise rotation of the brake drum ; and The location of the pivot or fulcrum to make the brake self locking for the clockwise rotation of the brake drum.