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Total No. of Questions : 07

**B.Tech (ME) (2012 Onwards)     (Sem.–6)**
# DESIGN OF MACHINE ELEMENTS-II
**Subject Code : BTME-601**
**M.Code : 71185**

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 SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**
3. **Select suitable design data from the data book wherever applicable.**

## SECTION-A

**Q1. Answer briefly :**

a) What is the 'curvature effect' in a helical spring? How will you incorporate influence of this effect in the design of a spring?

b) Specify the conditions that must be satisfied for the hydrodynamic lubrication to be possible.

c) Explain the purpose of using intermediate pulleys in case of belt drive.

d) Mention at least four major advantages of V-belt drive over flat-belt drive.

e) Explain why two diametrically opposite blocks arrangement is used in block brakes?

f) What is meant by undercutting of gear tooth?

g) How will you designate roller chain?

h) Differentiate between internal and external gears?

i) What is meant by nipping of leaf spring?

j) List the various sources that induce stresses in the flywheel rim.

**SECTION-B**

Q2.  An automotive internal expanding brake is shown in figure. The face width of the friction lining is 40 mm and the coefficient of friction is 0.35. The maximum intensity of normal pressure on the lining is limited to 0.8 N/mm$^2$. Calculate the actuating force P. If the drum rotates in clockwise direction then determine the torque acting on the right-hand shoe due to the braking action.
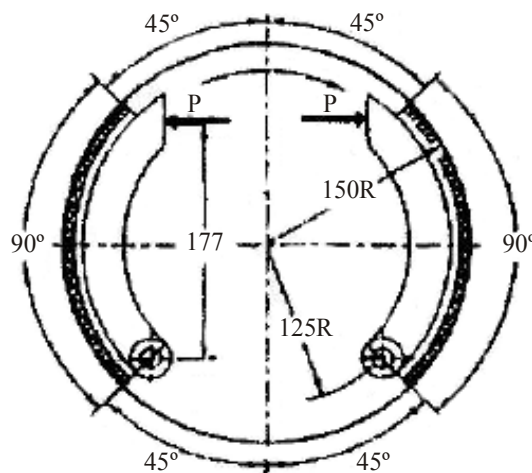


Q3.  A helical compression spring is subjected to a force of lkN. The deflection of the spring corresponding to this force is approximately 30 mm. The spring is made of cold-drawn steel wire with ultimate tensile strength of 1000 N/mm$^2$. The permissible shear stress for the spring wire is 500 N/mm$^2$. The spring has square and ground ends. A gap of 1 mm between adjacent coils under maximum load condition is required to be maintained. Design the spring. Assume, spring index = 6 and G = 8.14 kN/mm$^2$.

Q4   Based on manufacturer's catalogue design a V-belt drive to connect a 20 kW, 1440 rpm induction motor to a fan running at approximately 480 rpm, for a service of 24 hr per day. From the space considerations, the centre distance should be maintained approximately at 1.2 m.

Q5   A pair of spur gears consists of 24 and 48 teeth. The pinion rotates at 1000 rpm and has the module of 6 mm. The face width can be selected proportionately. Both gears are made of steel with an ultimate tensile strength of 500 N/mm$^2$. They are heat treated to a surface hardness of 270 BHN. Considering dynamic load based on preliminary design, calculate (i) beam strength and (ii) wear strength. Take service factor and the factor of safety as 1.5 and 2, respectively.

Q6    Design a journal bearing for a centrifugal pump from the following data :

Load on the journal = 19000 N, speed of the journal = 900 r.p.m. Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg /ms. Ambient temperature of oil is 15.5°C and maximum bearing pressure for the pump is 1.5 N/mm$^2$. Also calculate the mass of the lubricating oil required for artificial cooling, if the rise of temperature of oil is limited to 10°C. Heat dissipation coefficient = 1200 W/m /°C.

Q7    Design a chain drive with a duplex chain to connect 16 kW, 1400 rpm electric motor to a transmission shaft running at 350 rpm. The operation involves moderate shocks. During preliminary stages, the centre distance can be assumed to be 40 times the pitch of the chain.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**