

2053
B.E. (Mechanical Engineering)
Sixth Semester
MEC-601: Design of Machines Elements -- II

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use of design data book is allowed.

x-x-x

- I. Give clear and brief answers to following questions:-
- Why are worm gear reduction units not referred over other types of gear boxes for transmitting large power?
 - The cross-section of the arm of a flat belt pulley is usually elliptical with major axis in the plan of rotation. Why?
 - Why hydrodynamic journal bearing is called 'self acting bearing'?
 - What are self energizing brakes?
 - Give Petroffs equation for journal bearings. (5x2)

UNIT - I

- II. Two cast iron bevel gears have pitch diameters of 75 mm and 120 mm respectively. These are to be designed to transmit 2.5 kW power at a pinion speed of 1000 rpm. Taking pressure angle as 20° , find the face width and module from strength point of view. Also, check the gear for dynamic & wear conditions for safe operation. (10)
- III. a) What do you understand by the term "bearing characteristics number"?
- b) Design a full hydrodynamic journal bearing with following specifications for machine tool applications:
Radial load = 5 kN, journal speed = 1490 rpm, unit bearing pressure = 1.5 MPa, length-to-diameter ratio = 1.25, radial clearance = 0.05 mm, viscosity of lubricant = 20 cp, class of fit = H7e7. (2,8)
- IV. a) What do you understand by the term 'nipping' in leaf springs?
- b) A vertical spring loaded valve is required for a compressed air receiver. The valve is to start opening at a pressure of 1 N/mm^2 gauge and must be fully open with a lift of 4 mm at a pressure of 1.2 N/mm^2 gauge. The diameter of the port is 25 mm. Assuming allowable shear stress in the steel as 480 MPa and shear modulus as 80 kN/mm^2 , design a suitable closed-coil helical spring having squared ground ends. (2,8)

P.T.O.

UNIT - II

- V. It is required to design a chain drive to connect a 12 kW, 1400 rpm electric motor to a centrifugal pump running at 700 rpm. The service conditions involve moderate shock, (i) Select a proper roller chain and give a list of its dimensions. (ii) Determine pitch circle diameters of driving and driven sprockets, (iii) Determine number of chain links, (iv) Specify correct centre distance between axes of sprockets. (10)
- VI. a) What do you understand by 'basic static load rating' and 'dynamic load rating'?
- b) A ball bearing is operating on a work cycle consisting of following three parts: a radial load of 3000 N at 1440 rpm for one-quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle and a radial load of 2000 N at 1440 rpm for the remaining cycle. Calculate dynamic load carrying capacity of the bearing. (2,8)
- VII. a) What are internal-shoe internal-drum brakes?
- b) A multiplate disk clutch consists of five steel plates and four bronze plates and transmits 10 kW power at 750 rpm. The ratio of outside diameter to inner diameter of friction disks is 2. The coefficient of friction is 0.1 and the intensity of pressure on friction lining is limited to 0.3 N/mm^2 . Calculate inner and outside diameters of friction disks according to (i) uniform wear theory, & (ii) uniform pressure theory. (2,8)