

6E3049

Roll No. _____

Total No of Pages: **4****6E3049**

B. Tech. VI Sem. (Main & Back) Exam. May/June-2014
Mechanical Engineering
6ME1 Design of Machine Elements-II
(Common for ME and P&I)

Time: 3 Hours**Maximum Marks: 80****Min. Passing Marks: 24****Instructions to Candidates:-**

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

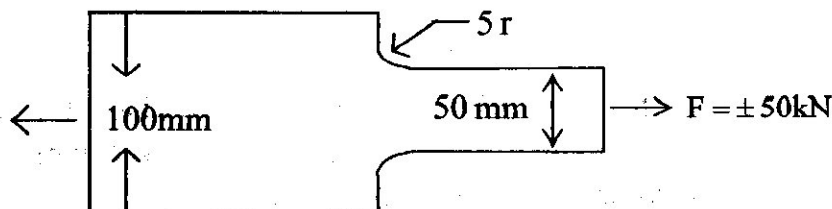
1. Design Data Handbook

2. _____

UNIT-I

Q.1 (a) Draw and describe Goodman and Soderberg diagram. [6]

(b) A component machined from a plate of thickness 't' has ultimate strength 630N/mm^2 . It is subjected to completely reversed axial force of 50kN . The expected reliability is 90% and factor of safety is 2. Determine the plate thickness for infinite life, if the notch sensitivity factor is 0.8. [10]

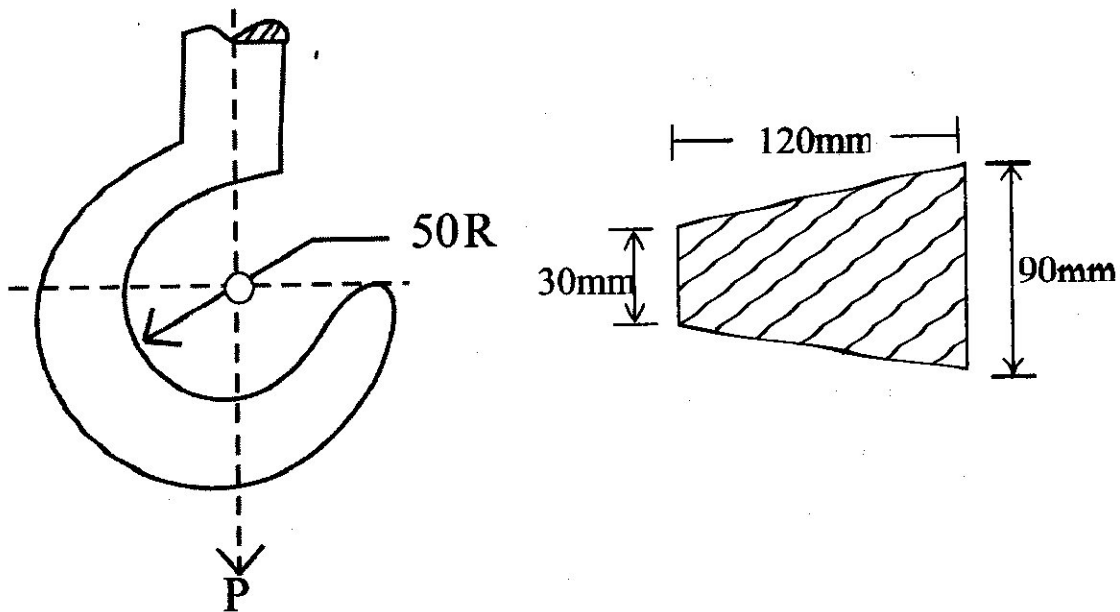
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OR

- Q.1 (a) What is stress concentration? Describe methods of reduction in stress concentration. [8]
- (b) A solid circular shaft made of steel with $\sigma_{ut} = 620\text{N/mm}^2$ and $\sigma_{yp} = 380\text{N/mm}^2$ is subjected to an alternating torsional moment which varies from -200 Nm to $+400\text{ Nm}$. The shaft is ground and the expected reliability is 90%. Neglecting stress concentration calculate shaft diameter for infinite life. The factor of safety is 2. [8]

UNIT-II

- Q.2 (a) Compare stress distribution in simple beam and curved beam. [6]
- (b) A crane hook having approximate trapezoidal section is shown in figure. It is made of steel having $\sigma_{yp} = 380\text{N/mm}^2$ and factor of safety is 3.5. Determine load carrying capacity of hook. [10]



OR

- Q.2 Design a simple screw jack for lifting a load of 10 kN and having a maximum lift of 250mm . The yield point strength of screw material is 240N/mm^2 for tension and compression and 150N/mm^2 for shear. The material for nut is phosphor bronze and yield point strength is 130N/mm^2 in tension and compression and 100N/mm^2 in shear.

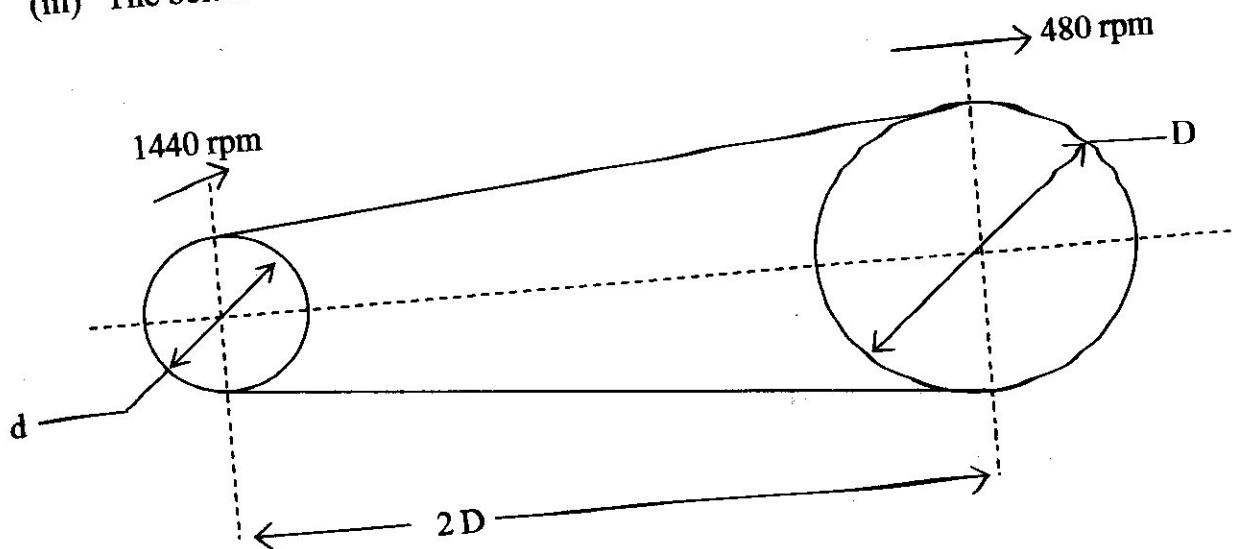
The maximum bearing pressure on threads is 18N/mm^2 . Coefficient of friction for threads and collar is 0.13. [16]

UNIT-III

- Q.3 (a) What do you understand by Wahl's factor? State its importance in design of helical springs. [6]
- (b) A helical spring of round wire supports a static load of 1000N . The inside diameter of spring coil must not be less than 50mm . The spring is to deflect by 15mm . The permissible shear stress of spring material is 400N/mm^2 . Calculate wire size, mean coil diameter, no. of effective turns, spring index, solid length, free length and spring stiffness. Assume plain ends of spring. [10]

OR

- Q.3 (a) Explain the chordal action of a chain drive. [6]
- (b) The layout of the leather belt drive transmitting 15 kW is shown in figure. The belt should operate at a velocity of 20 m/sec approximately and stress in belt should not exceed 2.25 N/mm^2 . Density of leather is 0.95 gm/cc and coefficient of friction is 0.35. The thickness of belt is 5mm . Calculate-
- The diameters of pulleys.
 - The length and width of belt.
 - The belt tension.
- [10]



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UNIT-IV

- Q.4 (a) Discuss materials used for gears. [6]
- (b) Determine module, face width, number of teeth and diameter of a pair of 20° involute full depth spur gear to transmit 112.5 kN from a pinion running at 750rpm to a gear running at 140rpm. The service is intermittent with light shocks. [10]

OR

- Q.4 (a) Why involute profile is employed more commonly as compared to cycloidal profile. [6]
- (b) A pair of parallel helical gears consists of an 18 teeth pinion meshing with a 45 teeth gear. A 7.5 kW power at 2000 rpm is supplied to pinion through its shaft. The normal module is 6mm while normal pressure angle is 20°. The helix angle is 23°. Determine the tangential, radial and axial components of the resultant tooth force. [10]

UNIT-V

- Q.5 (a) Discuss theory of Hydrodynamic lubrication. [6]
- (b) A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15m and load on it is 40 kN and its speed is 900rpm. Complete the design calculation for the bearing. [10]

OR

- Q.5 (a) Mention advantages and disadvantages of rolling contact bearings. [6]
- (b) A ball bearing supporting a gear shaft is subjected to a radial load of 1600N and a thrust load of 550N. Select proper bearing for a speed of 150 rpm. Life expectancy is 50×10^3 cycles. [10]