Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No .....

ME-5003-CBGS

B.E. V Semester

Examination, June 2020

Choice Based Grading System (CBGS)

Design of Machine Elements

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) What do you mean by Design process? What is the role of a designer? 7

   b) Explain about the concept of factor of safety for designing a machine element used in high precision. 7

2. a) How the strength of a steel material for shafting is estimated in ASME design code for shaft? 7

   b) A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10,000Nm. The shaft is made of steel having ultimate tensile stress of 700Mpa and a ultimate shear stress of 500Mpa. Assuming a factor of safety as 6. Determine the diameter of the shaft. 7

3. a) State the advantages and disadvantages of the chain drive over belt and rope drive. 7

   b) Select a wire rope for a vertical mine hoist to lift a load of 55kN from a depth 300 meters. The rope speed of 500 meters/min is to be attained in 10 seconds. 7

4. A centrifugal clutch is to be designed to transmit 15kW at 900rpm. The shoes are four in number. The speed at which the engagement begins is 3/4th of the running speed. The inside radius of the pulley rim is 150mm. The shoes material coefficient of friction may be taken as 0.25. Determine: 14
   i) Mass of the shoes
   ii) Size of the shoes

5. Describe with the help of a neat sketch the principle of operation of an internal expanding shoe brake. Derive the expression for the braking torque. 14

6. A bronze spur pinion rotating at 600rpm derives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast iron gear arc 84Mpa and 105Mpa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8mm. The face width of both the gears is 90mm. Find the power that can be transmitted from the standpoint of strength. 14

7. A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameters of the pinion and gear are 80mm and 100mm respectively. The tooth profiles of the gears are of 14.5° composite form. The allowable static stress for both the gears is 55Mpa. If the pinion transmits 2.75kW at 1100 rpm. Find the module and number of teeth on each gear from the stand points of strength and cheek the design from the stand point of wear. Take surface, endurance limit as 630Mpa and modulus of elasticity for cast iron as 84kPa. 14

8. Write short notes on any three 14
   a) Modeling of an engineering problem
   b) Shaft couplings
   c) Sunk keys
   d) Positive clutch

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