

C 62980

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Name.....

Reg. No.....



**SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE  
[SUPPLEMENTARY] EXAMINATION, APRIL 2014**

(2009 Scheme)

ME/PTME/AM 09 701 – MACHINE DESIGN – II

Time : Three Hours

Maximum : 70 Marks

**Part A**

*Answer all questions.*

- I. (a) What are the characteristics required for the material used for lining of friction surfaces of clutch?  
(b) What is meant by hydrodynamic lubrication?  
(c) How the bevel gears are classified? Explain with neat sketches.  
(d) What are the various causes of gear tooth failure?  
(e) Enumerate the various manufacturing methods of machine parts which a designer should know.

(5 × 2 = 10 marks)

**Part B**

*Answer any four questions.*

- II. (a) List the important factors upon which the capacity of a brake depends.  
(b) What are the advantages and disadvantages of V-belt over flat belt drive?  
(c) What are rolling contact bearings? Discuss their advantage over sliding contact bearings.  
(d) Explain Lewis equation.  
(e) Derive the expression for center distance of a worm gear in terms of axial load, load angle and velocity ratio.  
(f) State and explain two principal design rules for casting design.

(4 × 5 = 20 marks)

**Part C**

*Answer all questions.*

- III. (a) A single plate clutch, effective on both sides, is required to transmit 25 kW at 4000 r.p.m. Determine the outer and inner diameters of frictional surface if the coefficient of friction is 0.23, ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1 N/mm<sup>2</sup>. Also determine the axial thrust to be provided by springs. Assume theory of uniform wear.

Or

**Turn over**

- (b) Design a belt drive to transmit 110 kW for a system consisting of 2 pulleys of diameters 0.9 m and 1.2 m, center distance of 3.6 m, a belt speed 20 m/s, coefficient of friction 0.3, a slip of 1.2% at each pulley and 5% friction loss at each shaft, 20% over load.
- IV. (a) A single row angular contact ball bearing number 310 is used for an axial flow compressor. The bearing is to carry a radial load of 2500 N and an axial or thrust load of 1500 M. Assuming light shock load, determine the rating life of the bearing.

*Or*

- (b) A Journal bearing is proposed for a steam engine. The load on the Journal is 4 kN, diameter 70 mm, length 85 mm, speed 1800 r.p.m., diametral clearance 0.001 mm, ambient temperature 17° C. Oil SAE10 is used and the film temperature is 60° C. Determine the heat generated and heat dissipated. (Take absolute viscosity of SAE10 at 60° (= 0.014 kg/m-s).
- V. (a) Design a spur gear drive required to transmit 45 kW at a pinion speed of 800 r.p.m. The velocity ratio is 3.5 : 1. The teeth are 20° Full-depth involute with 18 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe static stress of 180 MPa. Assume a safe stress of 40 MPa for the material of the shaft and key.

*Or*

- (b) A pair of helical gears with 30° helix angle is used to transmit 15 kW at 10,000 r.p.m. of the pinion. The velocity ratio is 4:1. Both the gears are to be made of hardened steel of static strength 100 N/mm<sup>2</sup>. The gears are 20° stub and the pinion is to have 24 teeth. The face width may be taken as 14 times the module. Find the module and face width from the stand point of strength and check the gears for wear.
- VI. (a) What is the purpose of a working drawing? Briefly explain the elements that a working drawing package will contain.

*Or*

- (b) Discuss the aspects that must be considered in the design of forging components so that they comply with production technique requirements.

(4 × 10 = 40 marks)