

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2536

Roll No.

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B.Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

MACHINE DESIGN-II

Time : 3 Hours

Total Marks : 100

Note : (i) Attempt all questions.

(ii) Assume any missing data suitably.

(iii) Use of design data book is permitted.

1. Attempt any two parts of the following : (10×2=20)
- (a) A 20 degree full depth pinion drives a gear and transmits 11.25 kW at 1200 rpm. The observed data are : $m=5\text{mm}$, $t=24$, $T=54$, face width=50mm. The gears are made of same steel with BHN of 300. Check the gears for strength and wear.
- (b) A bakelite pinion is used to transmit power at 400 rpm. The module is 10 mm and the pitch diameter is 0.25m and the face width is 0.127m. The teeth are 20° standard involute. Determine (i) number of teeth, circular pitch and outside diameter of pinion (ii) the power the pinion should transmit for smooth intermittent service and (iii) the power for continuous service.
- (c) Briefly discuss the following :
- (i) System of gear teeth
- (ii) Pressure angle
- (iii) Interference in gears.

2. Attempt any two parts of the following : (10×2=20)

- (a) Discuss the classification of helical gears. With a neat sketch explain the forces acting on a helical gear and explain the formative number of teeth.
- (b) A 56 kW motor running at 450 rpm is geared to a pump by means of a helical gearing. The C30 forged steel pinion on the motor shaft is 200 mm in diameter and drives a good grade cast iron gear on the pump shaft at 120 rpm. Determine the module and the face width.
- (c) Design a worm drive for a speed reducer to transmit 30kW at a worm speed of 600 rpm. The desired velocity ratio is 25:1 and an efficiency of at least 87% is desired. Assume the worm and gear are made of hardened steel.

3. Attempt any two parts of the following : (10×2=20)

- (a) A sleeve bearing 50 mm diameter and 50mm long has a journal speed of 3000 rpm. The radial load on the bearing is 5.5 kN. The oil used is SAE 10 at an average temperature of 60°. If the ratio of minimum film thickness to diametral clearance is 0.5, determine radial clearance, heat loss and minimum film thickness.
- (b) Design a journal bearing for a centrifugal pump. The shaft diameter is 150 mm and length to diameter ratio is 1.6 and the load on the bearing is 40 kN. The speed of shaft is 1500 rpm.
- (c) Briefly explain the following :
 - (i) Wedge film lubrication
 - (ii) Squeeze film lubrication
 - (iii) Hydro-static lubrication.

4. Attempt any **two** parts of the following : (10×2=20)
- (a) Enumerate the advantages and disadvantages of rolling contact bearing. How will you classify the rolling contact bearings ?
 - (b) Explain basic static load rating and basic dynamic load rating. Select a single row deep groove ball bearing for a radial load of 4.5 kN and axial load of 6 kN, operating speed of 1500 rpm for an average life of 5 years at 10 hours per day under uniform and steady load condition.
 - (c) What is the *rated life* of a rolling contact bearing ? Find the rated life of a 60 mm bore, light series ball bearing under a 6000 N radial load at 600 rpm. The bearing rotates with the inner rings. There is no shock loading.
5. Attempt any **one** part of the following : (20×1=20)
- (a) Design an aluminium alloy piston for a single acting four stroke engine for the following specifications :
 - Cylinder bore = 0.30 m
 - Stroke = 0.375 m
 - Maximum gas pressure = 8 MPa
 - Brake mean effective pressure = 1.15 MPa
 - Fuel consumption = 0.22 kg/kW/hr
 - Speed = 500 rpm
 - (b) A four stroke petrol engine has following data :
 - Piston diameter = 100 mm
 - Stroke = 150 mm
 - Length of connecting rod = 315 mm

Weight of reciprocating parts = 18.2 N

Speed = 1500 rpm

Compression ratio = 4:1

Maximum explosion pressure = 2.40 MPa

Determine the size of rod cross section, dimensions of big and small ends of the connecting rod and size of bolts for big end cap.