

[03 – 4115]

IV/IV B.E. DEGREE EXAMINATION.

First Semester

Mechanical Engineering

DESIGN OF MACHINE ELEMENTS — II

(Effective from the admitted batch of 2006–2007)

Time : Three hours

Maximum : 70 marks

Question No.1 is compulsory.

Answer any FOUR from the remaining.

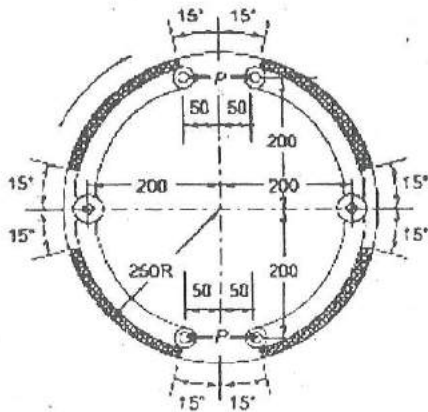
All questions carry equal marks.

Answer to Questions No. 1 must be at one place.

Data books are not allowed.

1. (a) What is crowning of gear tooth?
- (b) What is a piston slap? How it can be controlled?
- (c) Explain the principle of oil ring bearing.
- (d) Why clutches are usually designed on the basis of uniform pressure?
- (e) What is self energizing block brake?

intensity of normal pressure is limited to  $1 \text{ N/mm}^2$ . The coefficient of friction is  $0.30$ . Calculate the actuating force  $P$  and the torque absorbing capacity of the brake.



- (f) What are the functions of wire rope?
- (g) What are the advantages of disc brake over drum brake?

2. Design a pair of Spur gear with  $20^\circ$  full-depth involute teeth Consisting of a teeth Pinion meshing with a 50 teeth gear. The pinion shaft is Connected to a 22.5 kw, 1450 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material of the Pinion is plain carbon steel Fe 410 ( $S_{ut} = 410 \text{ N/mm}^2$ ). While the gear is made of grey cast iron FG 200 ( $S_{ut} = 200 \text{ N/mm}^2$ ). The factor of safety is 1.5.
3. (a) Explain the beam strength of bevel gear with a sketch.
- (b) A pair of worm gear is designated as 1/52/10/8. The worm rotates at 1000 rpm and the normal pressure angle is  $20^\circ$ . Determine the coefficient of friction and the efficiency of the worm gears.
4. Design a connecting rod for a petrol engine from the following data:
- Diameter of the piston = 120 mm,  
Weight of the reciprocating part = 1.0 kg,  
Length of the connecting rod = 3000 mm,  
Stroke length = 140 mm,  
Speed = 2000 rpm,  
Maximum explosion pressure =  $2.25 \text{ N/mm}^2$ .

5. A single plate clutch consists of only one pair of contacting surfaces. It is used for an engine, that develops a maximum torque of 120 N-m. Assume a factor of safety 1.5 to account for slippage at full engine torque. The permissible intensity of pressure is 350 kPa and the coefficient of friction is 0.35. Assuming uniform wear theory, calculate the inner and outer diameters of the friction lining.
6. (a) Explain McKee's Investigation for hydrodynamic bearing.
- (b) The hydrostatic step bearing of a vertical turbo generator consists of thrust load 450 kN. Shaft diameter 400 mm, recess diameter 250 mm, shaft speed 750 rpm and velocity of lubricant is 30 cp. Draw a neat sketch showing the effect of film thickness on energy losses. Calculate the optimum film thickness for minimum power loss.
7. (a) What is the difference between Thermosetting and thermo plastics?
- (b) Explain the design procedure of wrenches.
8. An internal expanding brake with four identical shoes is shown in figure below. Each hinge pin supports a pair of shoes. The actuating mechanism is designed in such a way that it produces same force  $P$  on each of the four shoes. The face width of the friction lining is 50 mm and the maximum