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Printed Pages – 4 **ME – 603**

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

PAPER ID : 4051 **Roll No.**

B.Tech.

SIXTH SEMESTER EXAMINATION, 2004-2005

MACHINE DESIGN-II

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt **ALL** the following questions.*

(ii) Draw neat sketches wherever necessary.

(iii) Use of Design Data-Book is permitted.

(iv) In case of numerical problems assume data wherever not provided.

1. (a) What condition must be satisfied in order that a pair of Spur gears may have a constant velocity ratio ? 5

(b) 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. **15**

OR

Design the teeth for two herring bone gears for a single reduction speed reducer whose velocity ratio is 3.80. The speed reducer is to transmit 27 kw when the pinion turns 3000 rev/min. The helix angle should be 30° and the teeth are to be 20° stub in the plane of rotation. The length of the face of the pinion should not exceed twice the pitch diameter.

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2. (a) How the bevel gears are classified ? Sketch neatly the working drawing of bevel gears in mesh. **5**

(b) A 50 hp power motor running at 750 r.p.m. drives another shaft at right angle through 90° bevel gearing. The velocity ratio is 3:1. The pinion, mounted on the power motor is of 20° full depth involute. Design the bevel gear drive providing minimum number of teeth on pinion to be 20. **15**

OR

Design a worm gearing to transmit 11 kw from an electric motor running at 1500 r.p.m. to a machine running at 75 r.p.m. Load is intermittent (< 3 hrs of continuous service) and steady.

3. (a) How do you express the life of a bearing ? What is an average or medium life ? **5**

OR

How will you classify the rolling contact bearings ? Compare ball and roller bearings.

(b) Select a suitable bearing which is to operate at 1500 r.p.m. and is acted upon by 8000 N radial load and 5000 N thrust load. The inner ring rotates, the load is steady and the service is continous. The shaft diameter, from strength consideration is 45 mm and the life expectancy is 500 hrs. **15**

OR

Select a single row deep groove ball bearing for a radial load of 4500 N and axial load of 55000 N, operating at speed of 1500 rpm, for an average life of 5 years running for 12 hours per day. Assume light shock load.

4. (a) Distinguish between "Hydro-dynamic bearings" and "Hydro-static bearing". 5

OR

Define "Bearing modulus" and "Sommerfeld number".

(b) Design a bearing and journal to support a load of 5.5 kN at 650 rev/min using a hardened steel journal and broze backed babbitt bearing. The bearing is lubricated by the oil rings. Take room temperature as 22° and the oil temperature as 85°C. 15

OR

Design a journal bearing for a centrifugal pump from the following data.

Load on Journal = 15000 N

Speed of the Journal = 900 rpm

Type of oil = SAE 10

Operating Temperature = 55°C

Ambient temperature of oil = 15.5°C

Maximum bearing pressure for pump = 1.5 N/mm^2

Calculate also the mass of lubricating oil required for artificial cooling if rise of temperature of oil be limited to 15°C. Heat dissipation co-efficient is 1232 $W/m^2/°C$.

5. (a) Why piston clearances are necessary ? What is its usual valves ? 5

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(b) A connecting rod is required to be designed for a high speed, four stroke I.C. engine. The following data are available. **15**

Diameter of piston = 88 mm.

Mass of reciprocating parts = 1.6 kg

Length of connecting rod (centre to centre) = 300mm

Stroke = 125 mm

R.P.M. = 2200 (when developing 50kw)

Compressing ratio = 6.8:1 (approximately)

Probable maximum explosion pressure (assumed shortly after dead centre, say at about 3°) = 3.5 N/mm^2.

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