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

PAPER ID : 140601 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VI) THEORY EXAMINATION 2013-14

MACHINE DESIGN-II

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **all** questions.
(2) Use of Design Data Book is permitted.
(3) Assume data suitably wherever not provided.

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

(a) A pair of 20° full depth straight teeth spur gears is to transmit 25 kW. The pinion rotates at 400 rpm and the velocity ratio is 4:1. The allowable static stresses for gear and pinion materials are 100 MPa and 120 MPa respectively. The Pinon has 16 teeths and face width is 12 times the module. Design the gear for static strength.

(b) A Bakelite pinion is used to transmit power at 1440 r.p.m. The module is 10 mm and pitch diameter is 0.25 m and face width is 0.127 m. The teeth are 20° standard involute. Determine :

(i) Number of teeth, circular pitch and outside diameter of pinion.

(ii) The power for smooth intermittent service.

(c) Briefly discuss the following :

(i) Pressure angle.

(ii) Failures in gear tooth and their causes.

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

(a) A worm gear has 30 teeth of 14½° and the coefficient of friction for worm gear is 0.05. The worm is triple threaded with a module of 6 mm and pitch circle diameter of 50 mm. Calculate the following :

(i) Lead angle of worm

(ii) Velocity ratio

(iii) Center distance

(iv) Efficiency of gearing.

(b) Design a spur gear drive required to transmit 45 kW at a pinion speed 800 rpm, the velocity ratio is 3:1. The teeth are 20° full depth involute with 18 teeth on pinion. The pinion and gear are made of steel.

(c) (i) What condition must be satisfied in order that a pair of spur gears may have a constant velocity ratio.

(ii) What is the importance of center distance in the design of worm and worm gear.

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

(a) What are Journal bearings ? Give a classification of these bearings and discuss them briefly.

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

(c) A turbine shaft running at 1800 r.p.m has a diameter of

300 mm. The load on the bearing due to shaft is 180 kN. Determine the length of the bearing if the allowable bearing pressure is 1.6 N/mm². Also find the amount of heat removed by the lubricant per minute, if the bearing temperature is 60° C and viscosity of the oil is 0.02 kg/m-s and the bearing clearance is 0.25 mm.

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

(a) Select a single row deep groove ball bearing for a radial load of 4500 N and axial load of 55,000 N operating at speed of 1500 rpm for an average life of 5 years running for 12 hours per day.

(b) Select a suitable roller bearing to carry a radial load of 25,000 N. The shaft rotates at 1500 rpm, average life is 4000 hours. Inner race rotates. Take mild shock.

(c) Indicate with proper justification the typical situations for which the following type of antifriction bearings are to be used exclusively :

(i) Deep groove ball bearing

(ii) Roller bearing.

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 specification :

Cylinder bore = 0.40 m; Break mean effective pressure = 2.5 MPa

Stroke = 0.480 m ; Fuel consumption = 0.36 kg/ kW/hr

Maximum gas pressure = 10 MPa ; Speed = 900 r.p.m

(b) Design a connecting rod for 4 stroke petrol engine with the following data :

Piston diameter = 0.20 m

Stroke length = 0.30 m

Length of connecting rod (centre to centre) = 50 m

Weight of reciprocating parts = 50 N

Speed is 1440 r.p.m with possible overspeed of 3000 r.p.m

compression ratio = 3:1

Maximum explosion pressure = 3 MPa