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.

(SEM. VI) EXAMINATION, 2006-07

MACHINE DESIGN - II

Time : 3 Hours]   *[Total Marks : 100*

Note :   *Attempts **all** questions. All questions carry **equal** marks. Use of design data book is permitted. Assume missing data and make necessary assumptions.*

1   Attempt any **two** of the following :   10×2=20

(a)   A compressor running at 300 rpm is driven by a 15 kW 1200 rpm motor through a 14 1/2 ° full depth gear. The centre distance is 0.375m. The motor pinion is to be of C-30 forged steel hardened and tempered, and the driven gear is to be of cast steel. Assuming medium shock conditions :

(i)   Determine the module, face width and number of teeth on each gear.

(ii)   Check the gears for wear.

(b)   Discuss the roles of Lewis and Buckingham equation in design of gears. Write down these equations and explain the various variable in the equation.

(c)   Two helical gears are used in a speed reducer that is driven by an I.C. Engine. The rated

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power of the speed reducer is 75 kW at a pinion speed of 1200 rpm. The speed ratio is 3 to 1. Assuming medium shock condition and 24 hour operation, find the module, face, number of teeth in each gear and the material and heat treatment requirement if the teeth are 20° full depth in the normal plane.

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

(a) A pair of high grade cast iron level gears having shaft at right angles are to have an angular velocity ratio of driver to driven of 2 to 3. The driver is to rotate at 180 rpm and is to transmit 9.75 kW. It is 0.30 m is pitch diameter. Take the width of face as about one third of the length of the pitch element and determine the pitch of the gear. Assume 24 hour/day operation.

(b) Design and determine the input power capacity of a worm gear speed reducer unit composed of a hardened steel worm and phosphor bronze worm wheel having 20° stub involute teeth. The centre distance is to be 200 mm, transmission ratio 10 and worm speed 1450 rpm.

(c) Discuss various methods for transmitting drives on non-parallel, non-intersecting shafts. Explain the terms – face angle, lead angle and pitch angle.

3 Attempt any **two** of the following :   **10×2=20**

(a) What consideration must be observed while mounting a ball or roller bearing? Describe the procedure.

(b) A bearing is required to carry 4500 N stationary radial load. The shaft rotates at 1000 rpm and the life desired is 30000 hours. The running conditions are steady, no shock loading. Select a suitable anti-friction bearing for this case, and justify your selection.

(c) A ball bearing is to be selected to carry a radial load of 9 kN and a thrust load of 4.5 kN. The average life is to be 5000 hours, with inner ring rotation of 900 rpm. What basic load rating must be used in selecting the bearing? If this bearing is to have a life of 5000 hours at a reliability of 98%, what is the basic load rating under these conditions ?

4 Attempt any **two** of the following: 10×2=20

(a) What is meant by bearing characteristic number? What is its significance? Discuss the variation of co-efficient of friction with bearing characteristic number.

(b) A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15 m and the load on it is 40 kN and its speed is 900 rpm. Design the bearing completely.

(c) Discuss various types of lubrication in case of journal bearings. Also describe some metallic and non-metallic bearing materials.

5 Attempt any **two** of the following :   10×2=20

(a) Design a connecting rod for a four stroke petrol engine with the following data:-
Piston dia = 0.10 m; stroke = 0.14 m; Length of connecting rod (centre to centre) = 0.315 m. Wt. of reciprocating parts = 18.2 N

Speed = 1500 rpm
Compression ratio = 4:1
Max. explosion pressure = 2.45 M pa.

(b) Design a centre crank for a double acting steam engine running at 150 rpm with a stroke of 0.35 m. The overhung flywheel weights 22.70 kN and the connecting rod force 'F' at dead centre is 45.40 kN. The engine is vertical.

(c) Determine the diameter of the piston rod for a steam cylinder 1.50 m in diameter, in which the greatest difference of pressure on the two sides of the piston is 0.2 M Pa. Length of the rod is 2.8 m. Factor of safety is 8.