MODEL QUESTION PAPER

VII SEMESTER B. Tech Degree Examination

Course Code and Name: 13.705MACHINE TOOL DESIGN (P)

Answer ALL questions from PART A and ONE full question from each module in PART B.

PART A

(5x4=20Marks)

1. State and explain law of gearing?
2. Explain the term virtual number of teeth in helical gears and derive the expression?
3. Discuss bearing characteristic number and bearing modulus as applied to journal bearing?
4. Explain the importance of ray-diagram in gear box design?
5. What are the factors affecting the stiffness of machine tool structures?

PART B
(20x4=80Marks)

MODULE – I

6. Design a journal bearing for a centrifugal pump for the following conditions
   Journal diameter = 75mm
   Speed of the journal = 1140 rpm
   Load on the journal = 11500N
7. Select a single row deep groove ball bearing for a radial load of 4000N and an axial load of 5000N,operating at a speed of 1600 rpm for an average life of 5 years at 10 hrs. per day. Assume uniform and steady load?

MODULE – II

8. A pair of helical gears 23º helix angle is used to transmit 25 KW at 3000 rpm from the pinion shaft with a velocity ratio of 3:1.The static strength of the gear material can be taken as 75N/mm$^{2.}$ Number of teeth on the pinion is 24.Find the module pitch, face width and axial thrust developed on the shaft for 20º full depth involute teeth and check the design against static strength considerations?

9. A 35 KW motor running at 1500 rpm drives a compressor at 720 rpm through 60º bevel gearing arrangement. The pinion has 24 teeth. The gear material can be taken as cast steel. Face width can be taken as 1/4 of the slant height of pitch cone. Design the gear pair for 20º stub teeth system?

MODULE – III

10. A six speed gear box is to be designed for transmitting 8 H.P with speed ranging from 600 rpm with common ratio as 1.25. Select the optimum ray diagram and hence calculate the gear sizes. Calculate the shaft sizes and sketch the gear box?

11. Design the headstock of a lathe having nine spindle speeds ranging from 50rpm. The machine capacity is 6KW, with common ratio as 1.5. Show the layout of gearbox and connection to the motor?

MODULE – IV

12. Explain design features and types of machine tool beds with neat sketches?

13. a) Discuss the methods of improving stiffness of machine tool structures?
    b) What are the methods to lower thermal stresses in machine tools? Explain with examples?