BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : V**
BRANCH: PRODUCTION **SESSION : MO/17**

SUBJECT: PE5003-MACHINE TOOL DESIGN

TIME: 3. Hours **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) What are the different elements of a machine tool drive? [2]

Q.1(b) A 300 mm long job is to be machined by a plain milling cutter of diameter D = 50 mm and 15 teeth. If the cutting speed is 50 m/min and feed is 0.1 mm/tooth, calculate the machining time for a depth of cut of 5 mm. Assume 10 mm approach length and 10 mm over travel. [4]

Q.1(c) Describe in detail the procedure for selection of electric motor for lathe. [6]

Q.2(a) What is stepped regulation of motion? [2]

Q.2(b) Draw the compound kinematic structure K-23. [4]

Q.2(c) How can different feed rate be achieved in a feedbox using Meander's mechanism? [6]

Q.3 Design a 6 speed gear box for transmitting 10 HP with speeds ranging from 300 rpm, with $\varphi = 1.4$. Select a suitable structural form and the optimum ray diagram. Calculate the shaft sizes. Calculate the gear sizes, module and width of the gears by considering mild steel gears with $\lambda=10$. [12]

Q.4(a) Calculate the maximum shear stress for an open section as shown below (Fig. 1), when subjected to a twisting moment of 100 kg.m. (Diemsions are in cm) [4]

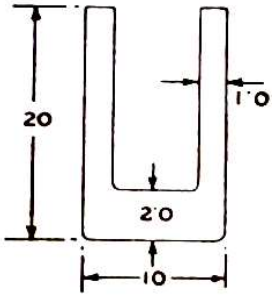


Fig. 1

Q.4(b) Design a lathe bed by considering shear stress due to torsion as design criteria. Assume oblique cutting conditions, and the position of the saddle is at the middle point between the centres. [8]

Q.5(a) What do you mean by hydrodynamic slideways? [2]

Q.5(b) Find out the forces acting on the mating surfaces in a combination of 'V' and Flat slideways in an orthogonal turning operation. [10]

Q.6(a) Explain dynamic stability and dynamic rigidity? [4]

Q.6(b) Explain the single degree of freedom chatter based on velocity principle using Arnold's model. [8]

Q.7(a) What are the basic function and requirement of control system in machine tool? [4]

Q.7(b) Discuss the various ergonomic consideration applied to the design of different control members: [8]
(i) Push buttons, (ii) Toggles, (iii) Knobs, (iv) Crank

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