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

CLASS: BE **SEMESTER : V**
BRANCH: PRODUTION **SESSION : MO/19**

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 hydraulic drive? [2]
Q.1(b) Determine the time that will be required to drill a blind hole of diameter of 25 mm and depth 30 mm in a steel block by a drill bit having 120° point angle. Cutting velocity and feed are 35 m/min and 0.2 mm/rev, respectively. Assume suitable approach length. [4]
Q.1(c) Explain with neat sketches the mechanisms used for transmitting intermittent motions. [6]

Q.2(a) Draw E-11 kinematic structure of broaching machine. [2]
Q.2(b) Derive the expression for calculating maximum productivity loss during machining. [4]
Q.2(c) Classify feed boxes and explain the working procedures of those which use tumbler gears. [6]

Q.3(a) What are the advantages of having preferred numbers in standard series? [2]
Q.3(b) A 2 x 2 gear box is to be designed for transmitting 10 HP with speed ranging from 400 rpm with φ = 1.4. Draw the optimum ray diagram. Calculate shaft sizes and gear sizes (numbers of gear teeth, module and width of gear teeth). [10]

Q.4(a) Give a brief classification of machine tool structure [2]
Q.4(b) Explain the different factors associated with selection of materials for machine tool structures. [4]
Q.4(c) Determine the maximum shear stress and angle of twist for a box section as shown in Figure 1. If it is subjected to twisting moment of 200 kg.m. Assume G = 8 x 10^5 kg/cm^2. All dimensions are in cm. [6]

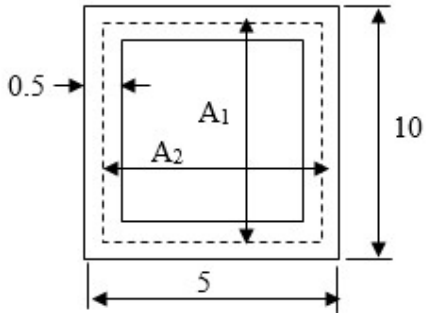

Figure 1

Q.5(a) Explain the working principle of hydrostatic slideways? [2]
Q.5(b) A lathe is subjected to 150 kg cutting force and 80 kg radial force, at the cutting point on the 50 mm diameter round work piece. By developing the mathematical expressions, determine reaction forces at contact surfaces acting on a V and flat combination guide-ways, if the saddle width is 150 mm. Height of the spindle centre above the flat guide-ways = 150 mm, saddle weight = 50 kg. Wedge angle of V guide-way are 45° each. (Assume the missing data if any.) [10]

Q.6(a) What is machine tool chatter? [2]
Q.6(b) Explain stick slip motion in machine tool slides with the help of a spring-mass system. [4]
Q.6(c) Discuss various effects of vibrations on machining performance and life of machine tools. [6]

Q.7(a) Why single lever system is preferred over multi lever system for controlling motion? [2]
Q.7(b) What are the basic function and requirement of control system in machine tool? [4]
Q.7(c) Discuss the ergonomic consideration applied to the manually operated control elements. [6]

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