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

CLASS: BE   SEMESTER: V
BRANCH: PRODUCTION   SESSION : MO/2019

SUBJECT : PE5003 MACHINE TOOL DESIGN

TIME: 1.5 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) How do you classify machine tools based on degree of automation? Give suitable example   [2]
          for each category.
     (b) What are the working motions in a machine tool? Explain by using an example of lathe   [3]
          machine.

Q2 (a) What are the different mechanisms used for transmitting intermittent motions?   [2]
     (b) Slab milling process is used to produce a flat surface of length 120 mm and width 60 mm   [3]
          in five passes. Calculate the total machining time if cutting velocity is 40 m/min and
          feed is 1 mm/tooth. Cutter diameter, cutter width and number of teeth in cutter are 60
          mm, 30 mm and 10, respectively. Assume approach and overtravel lengths are 5 mm,
          each.

Q3 (a) What is significance of ray restriction in ray diagram?   [2]
     (b) Explain with neat sketch the working principle of a spool-type direction control valve?   [3]

Q4 (a) What are the kinematic advantages of GP series over other progression series used for   [2]
          speed and feed regulation?
     (b) Draw and explain the C-13 kinematic structure of lathe machine.   [3]

Q5 (a) What is open type speed structure?   [2]
     (b) How preferred numbers in standard series of φ are derived by using dual and decimal   [3]
          geometric progression of standard speed ranges?

Q6   Design a 6-speed gear box. Minimum speed requirement is 300 rpm. The total speed range   [5]
          is divided using geometric progression with standard value of φ = 1.26. Calculate also the
          shaft diameters for transmitting 10 HP.

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