BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: BTECH   SEMESTER : VII
BRANCH: PE   SESSION : MO/2023

SUBJECT: PE311 MACHINE TOOL DESIGN

TIME: 02 Hours   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. **Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Under what circumstances will a stepper motor be preferred for the machine tool?	[2]	1	4
Q.1(b)	Explain, using a suitable diagram, any one mechanism utilized in a shaper machine for the translatory motion of its RAM.	[3]	1	3
Q.2(a)	What are the general requirements for designing a layout of step drive?	[2]	2	4
Q.2(b)	List down the factors on which selection of material for machine tool structure depends upon.	[3]	3	4

			CO	BL
Q.3	Design a two stage 6-speed gear box, for 125 to 715 rpm spindle speeds.		2	5
	(a) Draw the ray diagram,	1.5		
	(b) Calculate the number of teeth for all the gears. Assume minimum number of teeth=20.	3		
	(c) Calculate the shaft sizes. Assume shaft material to be made of c-20 (τ_s=120kg/cm^2)	2		
	(d) Sketch the gear box.	1.5		

			CO	BL
Q.4	While turning a workpiece 1500 mm long and 200 mm in diameter in a lathe, the following cutting forces act at 800 mm from the live center. Pz- 2000N, Px- 1000N, and Py- 400N. The tailstock imparts a force of 20 N to hold the workpiece, and the workpiece weighs 350 kg. Assume the height of the centers over the bed to be 400 mm.		3	5
	a. Draw the force diagram	[3]		
	b. Calculate	[4X1]		
	(i) the force dispositions at the live center.			
	(ii) the force dispositions at the dead center.			
	(iii) Torque at the spindle and,			
	(iv) Torque on the lathe bed under the saddle.			

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