

B.PROD. 3rd YEAR 1st SEM. ENGG. EXAMINATION, 2019**SUBJECT – MACHINE TOOL SYSTEMS**

Time: Three hours

Full Marks: 100

No of Questions		Marks
Answer question 1 and any <i>four</i> from the rest		
1.	(a) Define "Machine Tool" in the context of metal cutting and explain how system concept can be incorporated in it. (b) Classify and explain different surfaces which can be generated by machine tools. (c) Define "Generatrix" and "Directrix". (d) Briefly explain all techniques used as method of cutting in machine tools.	4 6 4 6
2.	(a) Explain types of machine tool's basic motions. (b) Explain following mechanisms utilized in machine tools: (i) Crank-Rocker mechanism, (ii) Worm and worm wheel mechanism, and (iii) Slider-Crank mechanism. (c) Identify utility of differential mechanism in machine tool. Describe rapid speed changing in a machine tool utilizing a sun-planet mechanism.	4 6 10
2.	(a) Identify various kinematic structure of machine tool which produce all formative motions. (b) Describe with neat sketch the kinematic structure of machine tool utilized for relieve grinding of taper taps. (c) A thread having a pitch of 2.15 mm is to be machined with a single point cutting tool having a pitch differential unit. The pitch of the leads screw is 6 mm. Calculate the inclination of the correction bar considering the module and teeth number of the pinion utilized for the purpose are 2 and 17 respectively and also draw the unit.	4 6 10
4.	(a) Explain briefly the basic scheme of Hobbing machine's Kinematic structure. (b) The kinematic structure for Fellow's Gear Shaping machine is shown in Fig. 1. It is desired to set the machine to cut spur gears of 60 teeth with module of 2 while gear cutter has 30 teeth. The permissible cutting velocity being 80 stroke/minute with a circumferential feed of 0.08 mm and radial in feed of 0.05mm/stroke. Determine: (i) Velocity change gears; (ii) Index change gears; (iii) Feed change gears; and (iv) Radial in feed change gears.	8 12

[Turn over

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5.	(a) State reasons which necessitate the variation of spindle speed in machine tools. (b) Describe in brief the significance of test line in saw diagram analysis with AP and GP series. (c) A stepped drive has to be designed for a lathe which has 12 speeds range from 10 to 450 rpm. The limiting cutting speed for the machine is 20 m/min. Calculate all the design parameters for AP and GP series. Select one series of rpm for the drive system and justify your selection on the basis of design data available from the design calculations.	4 4 12																												
6.	For a particular centre lathe, it is desired to design a speed gear box with a back gear arrangement as shown in Fig. 2. The speeds are laid from 10 to 450 rpm with $\phi = 1.2$. The motor is 20 HP at 1400 rpm. The structural form selected to the design is as shown in Fig. 3. Assume for machine tool $\frac{b}{m} = 10$ and for steel $c = 2$ The design should include the following: (i) Best ray diagram, (ii) Back gear ratio, (iii) Gear teeth calculations, (iv) Shaft diameters at all stages, (v) Gear module and width calculations.	4+2+8+3+3																												
7.	Design a kinematic structure for thread cutting arrangement in a lathe machine which has a lead screw of 4 T.P.I. The design should include calculations for the following units: (i) Norton gear box; (ii) Tumbler; and (iii) Mender drive for converting thread pitches into finer values. The designed kinematic system of the lathe should produce metric threads of the following standard:																													
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8	9	10	11	12	14	15																								
16	18	20	22	24	28	--																								
8.	Write short notes on any <i>two</i> of the following: (i) Backlash eliminators in milling machine. (ii) Feed drive system in drilling machine, (iii) Design of common ratios for machine tool drives (iv) Construction of speed diagram for machine tool	8+4+8 2x10																												

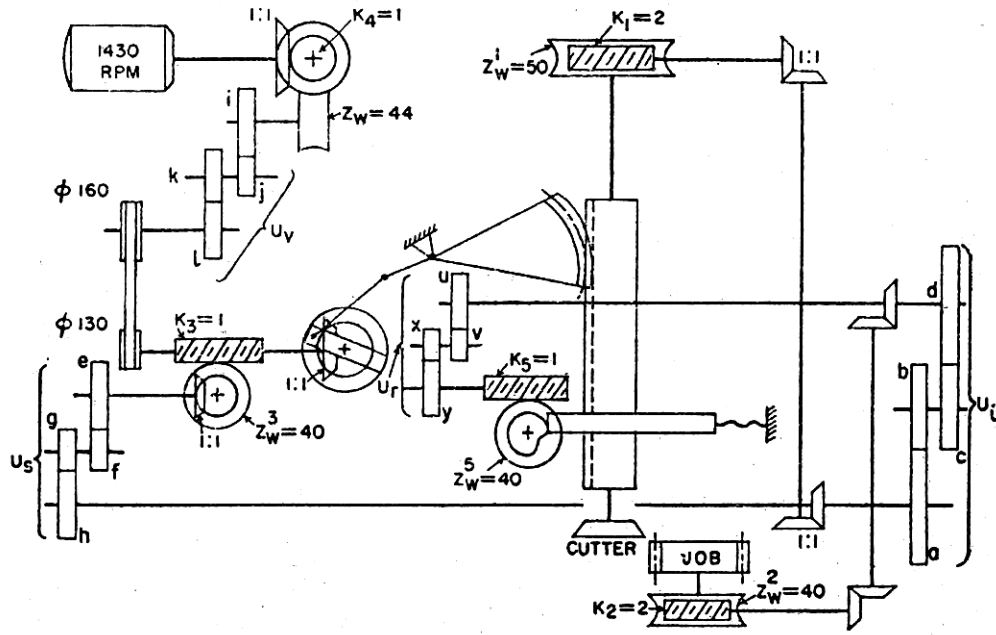


Fig. 1

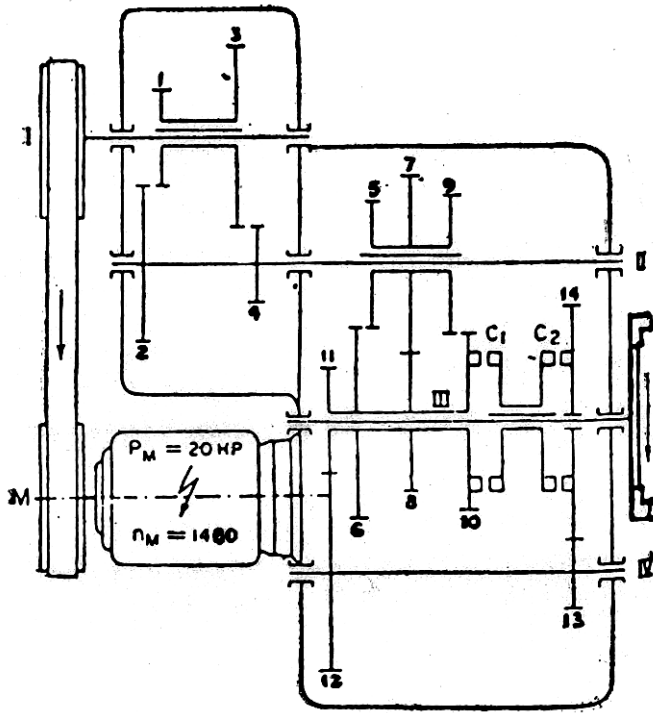


Fig. 2

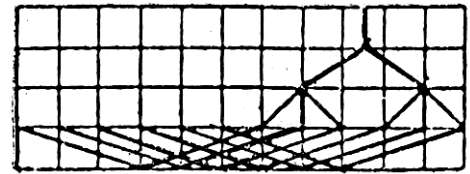


Fig. 3