Seat No. | | | | | | |

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मती - 012

Machine Tool Design

P. Pages : 2

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any five** questions.
5. Neat diagram must be drawn wherever necessary.
6. Figures to the right indicate full marks.
7. Assume suitable data ; if necessary.

1. a) What initial information do you require for designing a speed box ? Explain. **6**

b) Explain with suitable illustration, the difference between structural diagram and ray diagram. **6**

c) State the essential requirements for proper functioning of gear transmission in speed box. **8**

2. Design a 3 stage 12 speed gear box transmitting 7.5kW power with speed ranging from 80 rpm to 1000rpm. The minimum number of teeth on the gear is 17. Draw a structural diagram and calculate number of teeth on gear. The motor speed is 1440 r.p.m. **20**

3. a) Discuss the functions of machine tool structures and their requirements. **6**

b) What is the aim of speed and feed rate regulation in machining ? Explain with respect to its cost. **6**

c) Explain with neat sketch a hydraulic stepless regulation system for a machine tool. **8**

4. a) Discuss various factors that are responsible for the choice of a material (C.I. or steel) in manufacturing of machine tool structure. **6**

b) Explain about three commonly used column sections. In which machine tools are they used ? **6**

c) Discuss commonly used shapes of slideways and their applications. **8**

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5. a) "Stiffness of front bearing has greater influence upon deflection of spindle nose". Justify. 6

b) Optimum spacing between spindle supports is an important parameter in spindle design. Define it mathematically and explain it graphically. What values are recommended for design ? 6

c) Write down stepwise procedure to design a spindle for machine tool application. 8

6. a) What are the sources of vibration in machine tools ? Explain with suitable examples. 6

b) Explain stick - slip vibration in machine tool ? Enumerate commonly adopted methods in reducing the positional error due to stick - slip vibrations. 6

c) Explain by diagram how antifriction bearings of the spindle are preloaded. Why preloading is essential ? 8

7. a) Give a brief account of trends in machine tool design. 6

b) What are distinct characteristics features of NC machine tool as compared to conventional machine tools ? 6

c) Discuss in brief the APT motion statements for continuous path programming. 8

8. Write short notes on the following **any four.** 20

i) Ray diagrams.

ii) The necessity of interpolator in NC Machines.

iii) Selection of Electrical motor for machine tool drive.

iv) Design of antifriction guideways.

v) Design of bases and tables.

vi) Static and dynamic rigidity of machine tool structures.

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