

17532

21819

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

1. (A) Attempt any **THREE** of the following :

**12**

- (a) State the six general requirements of machine tool design.
- (b) Explain stress concentration factor. Why it is important in design ?
- (c) State the functions of machine tool structures.
- (d) Write down the four important features of aerostatic slideways.

(B) Attempt any **ONE** of the following :

**6**

- (a) Draw a complete block diagram of the design process in respect of machine tool. Explain the importance of technical specifications.
- (b) State the different materials used for machine tool structure. Write down its merits and demerits. (two each)

- 2. Attempt any FOUR of the following :** **16**
- (a) Productivity of a metal cutting machine tool may be raised ? Explain.
  - (b) Compare antifriction bearings to sliding bearings.
  - (c) Explain :
    - (i) Ray diagram
    - (ii) Speed chart
  - (d) Why feasibility of ray diagram is required ? How it is analysed ?
  - (e) Explain man-machine relationship with example.
- 3. Attempt any TWO of the following :** **16**
- (a) Explain the effect of aperture on the torsional stiffness of a box type structure with neat sketch. Write down its guidelines.
  - (b) Explain with neat sketch principle of operation of hydrostatic slideways and supply of oil by using restrictors.
  - (c) Vibrations in machine tools can be minimized. Explain the method in brief.
- 4. (A) Attempt any THREE of the following :** **12**
- (a) Write down the sections of machine tool structures. Suggest which section is best suited.
  - (b) State the different constraints for stepped regulation of speed.
  - (c) Explain with example the break up of speed steps.
  - (d) Explain aesthetics characteristics in m/c tool design.
- (B) Attempt any ONE of the following :** **6**
- (a) Why a.p. series is preferred ? Explain. Write down their merits & demerits.
  - (b) Draw open type and cross type structural diagram for structural formula  $2 \times 3 \times 1$ .

**5. Attempt any FOUR of the following :****16**

- (a) Explain Factor of Safety and Service factor.
- (b) Write down the four recommendations required for selection of spindle material.
- (c) Which information is provided by structural diagram ?
- (d) Explain the factors on which selection of common ratio depends.
- (e) Enlist type of vibration. Explain any one.
- (f) Explain ergonomic considerations applied to types of display.

**6. Attempt any FOUR of the following :****16**

- (a) Draw the effect of stiffener arrangement on torsional stiffness of open structure. State how to improve it.
- (b) State the major drawback of hydrodynamic slideways. How to overcome it ?
- (c) Explain in brief different types of bearings used in spindle support.
- (d) What are the control members used in ergonomic design ? State the function of each member.
- (e) Calculate the spindle speeds for the following :

Give  $\phi = 1.41$ ,  $N_1 = 42$  rpm and no. of steps six. Draw suitable structure and ray diagram for six speed.

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