



17532

16117

3 Hours / 100 Marks

Seat No.

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

	Marks
1. a) Attempt any three :	12
i) How machine tools are classified ?	4
ii) State requirements of machine tool structure (any four).	4
iii) Describe stick-slip phenomenon in case of guideways.	4
iv) What are working motion and auxiliary motions in machine tools ? Describe with suitable example.	4
b) Attempt any one :	6
i) Explain general design procedure of machine tool with suitable block diagram.	6
ii) What are different shapes of structures used in machine tools ? Draw neat sketches and state which one is the best.	6
2. Attempt any four :	16
i) Define :	
a) Factor of safety	4
b) Service factor.	
ii) State the functions and requirements of guideway (four each).	4
iii) Calculate the rpm values and diameter range served by each rpm for the following conditions $n_1 = 30$ rpm, $n_z = 375$ rpm no. of speed steps $z = 4$, $v = 20$ m/min for geometric progression.	4
iv) Write advantages of G.P. series used in spindle speeds.	4
v) Explain with suitable example man-machine relationship in machine tools.	4

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| 3. Attempt any two : | 16 |
| i) Explain with neat sketches effect of stiffener arrangement on the bending and torsional stiffness of box type structures. | 8 |
| ii) State the function, requirements and materials of spindle unit. | 8 |
| iii) What are the types and sources of vibrations in machine tool ? Give any two methods of reducing it. | 8 |
| 4. a) Attempt any three : | 12 |
| i) State different materials used for machine tool structures. Give its properties (any four). | 4 |
| ii) Explain the importance of speed chart in design of speed box. | 4 |
| iii) Write the initial information required for designing a speed box. | 4 |
| iv) With suitable diagram give the function of Levers and Handwheel in ergonomic considerations applied to the design of control members. | 4 |
| b) Attempt any one : | 6 |
| i) What are different types of antifriction ways ? Draw and describe any two. | 6 |
| ii) Give the guidelines for selection of the best structural diagram for machine tool. | 6 |
| 5. Attempt any four : | 16 |
| i) Explain ergonomic considerations applied to location of displays and control members. | 4 |
| ii) Explain in brief the concept of natural frequency of vibration. | 4 |
| iii) Check the feasibility of structural formula $2(1)3(2)$ for geometric ratio of 1.58. | 4 |
| iv) State the essential requirement for layout of stepped drive. | 4 |
| v) Define stress concentration. Explain methods of reducing it. | 4 |
| vi) Explain preloading of bearing. | 4 |
| 6. Attempt any four : | 16 |
| i) State different values of ϕ (common ratio) and factors on which selection of ϕ depends. | 4 |
| ii) What are types of bearing used for spindle support ? Explain with neat sketch. | 4 |
| iii) Explain role of aesthetic considerations in machine tools. | 4 |
| iv) Differentiate between hydrostatic and hydrodynamic slideways. | 4 |
| v) What are recent trends in manufacturing of machine tools structures ? | 4 |
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