

SEAL

I/LM/R-EXAM
2020

400022

MECHANICAL ENGINEERING

Time : 3 hours]

[Full Marks : 100

- Notes :** (i) Answer the questions as directed.
(ii) The figures in the right-hand margin indicate full marks for the questions.
(iii) Group A is compulsory. Attempt any **Four** questions from Group B.

GROUP—A

(Compulsory Group)

1. Attempt any *ten* from the following:

2×10=20

- (a) What is break-even analysis?
- (b) What is tachometer?
- (c) Define specific speed of a turbine.
- (d) What is stiffness of spring?
- (e) What is lead of screw thread?
- (f) What is an interference fit?
- (g) What is epicyclic gear train?
- (h) What are inversions of a mechanism?
- (i) Define torsional rigidity.
- (j) What is extensive property?
- (k) What is triple point?
- (l) What is enthalpy?

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GROUP—B

2. Attempt any *four* from the following : 5×4=20
- (a) How does a differential manometer differ from a simple manometer?
 - (b) What are unilateral and bilateral tolerances?
 - (c) Write a short note on 'mechanical comparator'.
 - (d) Define TQM and ISO 9000 quality system.
 - (e) Show that heat is a path function.
 - (f) What is cavitation? How can it be avoided?
3. Attempt any *four* from the following : 5×4=20
- (a) How are dynamometers classified?
 - (b) What are the conditions that would allow a continuous chip to be formed in metal cutting?
 - (c) Find an expression of torque transmitted by a hollow circular shaft.
 - (d) What do you understand by major and minor energy losses in pipes?
 - (e) What is heat pump? How does it differ from a refrigerator?
 - (f) What is the difference between rigid and flexible couplings?
4. Attempt any *four* from the following : 5×4=20
- (a) Define inventory control. Why are inventories needed?
 - (b) Explain how the failure of a short and of a long column takes place.
 - (c) A tool life of 80 minutes is obtained at a speed of 30m/min and 10 minutes at 60m/min. Determine the tool life equation.
 - (d) Define continuity equation and Bernoulli's equation.
 - (e) What is the difference between brakes and dynamometer?

5. Attempt any *four* from the following: 5×4=20
- (a) Show that for a beam subjected to pure bending, neutral axis coincides with the centroid of the cross-section.
 - (b) State Buckingham's π -theorem. How are the repeating variables selected for dimensional analysis?
 - (c) What are the causes of irreversibility of a process?
 - (d) What are the advantages of hollow shaft over solid shaft?
 - (e) A number of forces is acting on a body. What are the conditions of equilibrium of the body?
6. Explain briefly the following as applied to flow measurement : 20
- (a) Venturi meter
 - (b) Orifice meter
 - (c) Pitot tube
7. (a) Explain iron-carbon equilibrium diagram. 10
- (b) What is crystal structure? Explain with neat diagrams the crystal structure for metallic elements. 10
8. A beam *ABC* 9 m long, is simply supported at *A* and *B* at a distance of 6 m. The part *BC* is an overhang of 3 m length. A uniformly distributed load of 2 N/m acts throughout the length of the beam. A downward concentrated force of 5 N acts at the free end *C*. Draw the shear force and bending moment diagram. 20