

**SAMPLE PAPERS**  
**DIPLOMA FIRST SEMESTER EXAMINATION 2025 (JUT)**  
**MECHANICAL SCIENCE & ENGINEERING**  
*DIPLOMA WALLAH*

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**Instructions:**

1. **Question No. 1 is compulsory.** It contains 7 MCQs of 2 marks each.
  2. Answer any **FOUR** questions from the remaining (Q.2 to Q.7).
  3. All questions (Q.2 to Q.7) carry 14 marks each (typically divided into 7+7).
  4. Use neat sketches wherever necessary.
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**Q.1 Choose the correct option: (7 × 2 = 14 Marks)**

i. Which element is primarily added to steel to provide "Stainless" properties (corrosion resistance)?

- a) Silicon
- b) Chromium
- c) Manganese
- d) Phosphorus

ii. A "Muff Coupling" is categorized as which type of coupling?

- a) Flexible Coupling
- b) Rigid Coupling
- c) Universal Coupling
- d) Fluid Coupling

iii. Which material is commonly used for manufacturing transmission shafts?

- a) High carbon steel
- b) Mild steel
- c) Cast Iron
- d) Aluminum

iv. The "Pitch" of a screw thread is defined as:

- a) Total length of the screw
  - b) Distance between two corresponding points on adjacent threads
  - c) Diameter of the screw head
  - d) The angle of the thread
- v. Which drive system is most suitable for very short distances and prevents any slip?
- a) Flat belt drive
  - b) Chain drive
  - c) Rope drive
  - d) V-belt drive
- vi. The ratio of Brake Power (BP) to Indicated Power (IP) is called:
- a) Volumetric Efficiency
  - b) Mechanical Efficiency
  - c) Thermal Efficiency
  - d) Relative Efficiency
- vii. In a 2-stroke engine, one power stroke is obtained in:
- a) One revolution of the crankshaft
  - b) Two revolutions of the crankshaft
  - c) Four revolutions of the crankshaft
  - d) Half revolution of the crankshaft

**SECTION – B (Answer any FOUR questions)**

Q.2

A. Compare and contrast Two-Stroke vs. Four-Stroke Engines with at least 5 points. [7 Marks]

B. Explain the procedure and property changes for the Normalizing process. [7 Marks]

Q.3

A. Describe the construction and working of Roller Bearings, stating their advantages over ball bearings. [7 Marks]

B. Explain the construction and application of a Woodruff Key with a sketch. [7 Marks]

Q.4

A. List the advantages and disadvantages of using Gear Drives over belt or chain drives. [7 Marks]

B. Define Mean Effective Pressure (MEP) and explain its significance in engine performance. [7 Marks]

Q.5

A. Classify Cast Iron based on its structure and mention one application for Alloy Cast Iron. [7 Marks]

B. Explain the working principle of Nitriding (or Induction Hardening) as a surface hardening process. [7 Marks]

Q.6

A. Differentiate between Sliding Contact Bearings and Rolling Contact Bearings with examples. [7 Marks]

B. Calculate the Velocity Ratio for an open belt drive where the driver pulley diameter is 400 mm and the driven pulley is 200 mm, assuming 2% slip. [7 Marks]

Q.7 Write short notes on any FOUR: ( $4 \times 3.5 = 14$  Marks)

A. Brake Thermal Efficiency

B. Properties of Bronze (Copper Alloy)

C. Advantages of Screwed Joints

D. Simple vs. Compound Gear Train

E. Compression Ratio (CR)



**✔ SOLUTIONS – PAPER 2****MCQ Answer Key:**

i (b), ii (b), iii (b), iv (b), v (b), vi (b), vii (a).

**Short Answer Solutions:**

- **MEP:** It is the average pressure acting on the piston throughout the power stroke. Higher MEP usually means higher engine power<sup>6</sup>.
- **Bronze:** An alloy of Copper and Tin. It is corrosion-resistant and has good bearing properties<sup>7</sup>.

