

**DIPLOMA - VIEP - MECHANICAL  
ENGINEERING (DMEVI)**

**Term-End Examination**

**December, 2015**

**BIME-024 : ENGINEERING METALLURGY**

*Time : 2 hours*

*Maximum Marks : 70*

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**Note :** *Attempt five questions in all. Question no. 1 is compulsory. All questions carry equal marks.*

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1. Choose the correct answer from the given four alternatives.  $7 \times 2 = 14$

(a) If a material recovers its original dimensions, when the load is removed, it is known as

- (i) Brittle
- (ii) Elastic
- (iii) Plastic
- (iv) Annealed

(b) Any process of heating and cooling steel that produces a rounded or globular form of carbide is known as

- (i) Normalizing
- (ii) Ultra-hardening
- (iii) Drawing
- (iv) Spheroidizing

- (c) The dominant elements in shock resisting tool steel are
- (i) Chromium, tungsten
  - (ii) Carbon, iron
  - (iii) Cobalt, nickel
  - (iv) Aluminium, copper
- (d) In powder metallurgy, the process of heating the cold pressed metal powder is known as
- (i) Sintering
  - (ii) Granulation
  - (iii) Deposition
  - (iv) Precipitation
- (e) In high speed steel, the maximum percentage of any alloying element is
- (i) Carbon
  - (ii) Tungsten
  - (iii) Chromium
  - (iv) Vanadium
- (f) A unit cell having nine atomic positions is called
- (i) Body-centred cubic space lattice
  - (ii) Face-centred cubic space lattice
  - (iii) Close-packed hexagonal space lattice
  - (iv) None of the above

- (g) White cast-iron is produced from grey cast-iron by the process of
- (i) Slow heating
  - (ii) Rapid heating
  - (iii) Slow cooling
  - (iv) Rapid cooling
2. (a) State the difference between steel and cast-iron with respect to their composition, properties and applications.
- (b) State the reasons why white cast-iron is more brittle than grey cast-iron. 7+7
3. (a) Name two alloying elements other than carbon, commonly employed in steel, and also explain how they influence the properties of steel.
- (b) Describe the ranges of major alloying elements for low, medium, and high carbon steels. Give two applications for each range. 7+7
4. (a) Discuss the advantages of aluminium alloys over ferrous alloys.
- (b) Distinguish clearly between hardness and hardenability. Explain a method of measuring the hardenability of steel. 7+7
5. (a) Differentiate between normalizing and annealing, in terms of the process and nature of the product.
- (b) What do you understand by isotropy and anisotropy? Illustrate with examples. 7+7

6. (a) State the effects of important alloying elements on the properties of steel.
- (b) What are the necessary properties of a bearing alloy ? Name some important bearing metals. 7+7
7. (a) What is the difference between flame hardening and induction hardening ? State their advantages, limitations and applications.
- (b) Explain the objectives of powder compaction and list the important products of powder metallurgy. 7+7
8. (a) State whether the following statements are *true(T)* or *false(F)* :
- (i) Magnetic particle test can be done on all metals.
  - (ii) Radiography has limitation on metal thickness.
  - (iii) Industrial practice mentions hardness value as Rockwell C.
  - (iv) Eddy current test can also be used to measure the thickness of a non-conducting coating such as paint on a metal.
  - (v) Acoustic waves with frequencies higher than the audio range are known as ultrasonic.
- (b) What are the major advantages of non-destructive testing ? Describe. 10+4