

ITL 705 (Materials for tribological applications)

I Minor Exam 2015, 30/8/2015

Time 1 hrs

Marks 25

**Question 1**

- (i) List the principal factors which affects the wear of materials? (1)
- (ii) Explain abrasive and fretting wear and suggest suitable material for wear resistance for both (give reasons)? (1)
- (iii) Explain the process of fatigue failure and suggest a suitable material with reason to prevent it. (1.5)
- (iv) What do you mean by tribological contact? List the assumptions in Hertzian contact analysis? (1.5)

**Question 2:** Answer following briefly

- (i) What are the tribological relevant properties of materials? (1)
- (ii) What is rule for tribological compatibility and its limitations? (1.5)
- (iii) What is allotropic change in metals? Explain the allotropic changes in pure iron? (1.5)
- (iv) What is precipitation hardening? (1)

**Question 3:** Differentiate following

- (i) Hypoeutectoid and hypereutectoid steel; draw microstructure also (1)
- (ii) Pearlitic and martensitic steel; draw microstructure also (1)
- (iii) Bainitic and tempered-martensitic steel; draw microstructure also (1)
- (iv) Adhesive and abrasive wear (1)
- (v) Scuffing and pitting in gears (1)

**Question 4**

- (i) List the parameter for piston-cylinder tribopair and material with recent advances? (1)
- (ii) Write a short note on tribological use of magnesium alloy? What elements are present in AZ61 and AM60 alloys? (1.5)
- (iii) What are the mechanism of nano-lubrication? (1)
- (iv) Write a short note of materials for biotribological applications? (1.5)

P.T.O.

**Question 5**

- (i) Why ferrite has very low solubility of carbon, while austenite has high solubility of carbon? (1)
- (ii) What is the expected crystal structure of martensite and why? (1)
- (iii) Differentiate Eutectoid and proeutectoid cemented carbides? (1)
- (iv) Refer to the TTT diagram for the 0.45wt % C hypoeutectoid steel attached. What microstructure would result from: (2)

- B + M:** — (a) Cooling the steel from 800°C to 100 °C in less than 2 seconds?
- B** — (b) Cooling the steel quickly from 800 °C to 600°C and holding for 1 minute before cooling to 100°C in 2 sec?
- (c) Cooling the steel from 800°C to 350°C in less than 2 seconds and holding for 1hour before cooling to 100°C?
- M** — (d) Cooling quickly from 800°C

