UNIVERSITY OF GHANA

SCHOOL OF ENGINEERING SCIENCE

BSc. (Eng) MATERIALS SCIENCE AND ENGINEERING
SECOND SEMESTER EXAMINATIONS 2014/2015
MTEN 416: CORROSION AND CORROSION CONTROL (2 CREDITS)

TIME- 2 HRS

ATTEMPT ALL QUESTIONS

Question 1

a) State the two major reasons why metals corrode? *(2 marks)*

b) Distinguish between the following:

i. Standard electrode potential and corrosion potential. *(4 marks)*

ii. Corrosion current density and anodic current density. *(4 marks)*

iii. Anode and cathode. *(4 marks)*

iv. Galvanic cell and electrolytic cell. *(4 marks)*

c) With the help of a suitable diagram, explain the following:

i. Activation polarisation *(4 marks)*

ii. Concentration polarisation *(4 marks)*

d) A zinc specimen (atomic weight and density of zinc are 65.4 g/mol and 7.14 g/cm^3, respectively) exposed to an acid solution loses 25 milligrams during a 12 hour exposure.

i. What is the equivalent current flowing due to corrosion? *(4 marks)*

ii. If the specimen area is 200 cm^2, what is the corrosion rate in mg per dm^2 per day due to this current? *(4 marks)*

iii. What is the corrosion rate in mpy? *(1 mark)*

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Question 2

a) State whether the statements below are TRUE or FALSE. Justify your conclusion convincingly:

i. Stray-current corrosion can be avoided by placing a low resistance metallic conductor between the two structures involved in current leakage and the affected one. ***(4 marks)***

ii. Anodic protection is suitable for all types of metals and alloys irrespective of the environment. ***(4 marks)***

iii. Kinetic processes are not indicated in Eh – pH diagrams. ***(4 marks)***

iv. The corrosion rate of active metals in contact with relatively nobler metals in a medium depends on the type of the reduction reaction. ***(4 marks)***

b) Sketch the anodic polarization curve for a metal that exhibits active-passive behaviour in an Evans diagram, labelling the axis. Indicate the following on the graph.

i. Corrosion potential

ii. Corrosion current density

iii. Primary passive potential

iv. Passive current density

v. Transpassive potential

vi. Critical current density ***(7 marks)***

c) State four differences between galvanizing and tinning. ***(4 marks)***

d) Discuss four environmental factors that could influence corrosion of materials. ***(8 marks)***

END OF EXAM

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