UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2004/2005 Academic Session

October 2004

EAS 662/4 – Structural Retrofitting Technology

Duration: 3 hours

Instructions to candidates:

1. Ensure that this paper contains **THREE** (3) printed pages before you start your examination.

2. This paper contains **FIVE** (5) questions. Answer **FOUR** (4) questions only. Marks will be given to the **FIRST FOUR** (4) questions put in order on the answer script and **NOT** the **BEST FOUR** (4).

3. All questions **MUST BE** answered in English.

4. All questions **MUST BE** answered on a new sheet.

5. All questions carry equal marks.

6. Write the answered question numbers on the cover sheet of the answer script.

1. (a) Explain how patched accelerated corrosion could occur and describe a suitable technique to overcome or reduce the risk of it occurring. Use appropriate sketches to aid your explanation.

(10 marks)

(b) With the aid of appropriate sketches, explain how galvanic and impressed current cathodic protection systems work.

(12 marks)

(c) Explain why impressed current cathodic protection is not recommended for corrosion damage prestressed concrete structure or prestressed concrete structural elements.

(3 marks)

2. (a) Sulphate attack is one of the problems normally encountered in existing concrete structures in this country, especially those exposed to marine environment, ground and groundwater, as well as structures in industrial areas. Explain in detail how sulphate attack occurs and causes damaging effects to concrete structures.

(8 marks)

(b) Discuss the measures that could be taken to prevent or reduce the risk of occurrence of sulphate attack.

(5 marks)

(c) You are required to assess the sulphate resistant performance of several cementitious repair materials. Suggest three tests that could be used and describe how the sulphate resistant performance of the repair materials could be assessed using one of the tests suggested.

(5 marks)

(d) A reinforced concrete school building located in Grik, Perak has been reported to undergo reinforcement corrosion 20 years after construction. The cracks appear to be uniform and run approximately in the direction of the reinforcement. Explain the probable cause of the corrosion problem. Describe in detail the mechanism of reinforcement corrosion at work.

(7 marks)

3. (a) The durability and long-term performance of concrete could be improved by giving consideration to aspects related to materials selection, mix proportions, construction practices, compliance requirements and maintenance. Discuss how more durable concrete structures could be produced by taking into account the five aspects listed.

(20 marks)

(b) Describe the concept of performance based specifications for concrete and compare with what is being practiced currently.

(5 marks)