
UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2005/2006 Academic Session

November 2005

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. Each question carry equal marks.
4. All questions **CAN BE** answered in English or Bahasa Malaysia or combination of both languages.
5. Each question **MUST BE** answered on a new sheet.
6. Write the answered question numbers on the cover sheet of the answer script.

1. (a) Describe the mechanism how superplasticiser works. Explain how the use of superplasticiser could enhance the strength and durability performance of concrete.
(10 marks)
- (b) Explain how the use of pozzolan could reduce the likelihood of sulphate attack in concrete.
(8 marks)
- (c) In the event of exposure to $MgSO_4$ solution, a low water/binder ratio concrete and a concrete containing pozzolan performed badly, in comparison to a higher water/binder ratio concrete and a concrete containing no pozzolan, respectively. Give the probable explanation for these phenomena.
(7 marks)
2. (a) A four storey reinforced concrete school building has suffered some damages due to fire. Suggest and discuss the tests that should be conducted in the appraisal for the fire damaged school building.
(10 marks)
- (b) List and discuss the important properties of the repair material to be used in repairing the main structural elements of the above fire damaged school building.
(10 marks)
- (c) Some of the repaired structural members of the school building in (a) show some sign of distress a few months after being repaired. The concrete cracks, but the repair material seems to be intact. Explain the probable causes of the observed distress.
(5 marks)
3. (a) Briefly explain the mechanisms of protective coating work. For each mechanism, use an appropriate sketch to elucidate your explanation.
(5 marks)
- (b) Several piers of a marine jetty have been repaired by patching and pressure grouting as a result of reinforcement corrosion. A few months after the repair was performed, some new corrosion problems have been observed at several places surrounding the repaired areas. Explain how this phenomenon occur and describe a suitable technique to reduce the risk of it occurring. Use appropriate sketches to aid your explanation.
(10 marks)
- (c) With the aid of appropriate sketches, explain the principles how chloride extraction and realkalization work.
(10 marks)

4. (a) By giving appropriate examples and sketches explain what is meant by passive and active strengthening of structure or structural member.
(6 marks)
- (b) Describe the procedures commonly adopted for strengthening a distressed reinforced concrete beam using steel plate bonding technique.
(14 marks)
- (c) Discuss the limitations of the plate bonding technique.
(5 marks)
5. (a) Patching is suitable for repairing small areas of spalling. Describe the important requirements that should be considered while carrying out patch repair.
(9 marks)
- (b) Explain the procedures to reinstate and strengthen a reinforced concrete column which has undergone corrosion problem by using prepacked aggregate jacketing technique.
(16 marks)