Illinois Society of Professional Engineers - University of Illinois College of Engineering
Professional Engineer On-Line Seminars

INSTRUCTIONS:

1. View the on-line seminar.
2. Complete the quiz below.
3. Complete the “Engineer Information” section.
4. Make a copy for your records.
5. Mail the quiz along with your $20 payment (credit card information or check payable ISPE) to: ISPE, 100 East Washington Street, Springfield, IL 62701.

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Each seminar/quiz is worth 1 Professional Development Hour.

QUIZ 04-08
TOPIC: Assessment of Precast Bridge Piers with Unbonded Post-tensioning Tolerant Fiber-reinforced Concrete
PRESENTER: Sarah L. Billington

1. What is the required volume ratio of fibers used in High performance fiber-reinforced cement-based composites (HPFRCC)
   a) Less than 3%.
   b) Less than 2%.
   c) More than 1.5%.
   d) More than 2.5%.

2. Which of the following are Damage-tolerant Fiber-reinforced Concrete
   a) High performance fiber-reinforced cement-based composites (HPFRCC).
   b) Hybrid Fiber Concrete.
   c) Engineered Cementitious Composites (ECC).
   d) All of the above.

3. HPFRCC has much larger ductility than normal concrete and lightweight concrete while not only in compression but also in tension.
   (circle) TRUE FALSE

4. In seismic regions, the Damage-tolerant Fiber-reinforced Concrete can provide what benefits for RC structures
   a) Energy dissipation.
   b) Increased strength.
   c) Reduced damage (no spalling, cracks close upon unloading).
   d) All the above.

5. The experiments by Prof. Billington for Precast Concrete Bridge Pier Systems included small-scale and large-scale testing, in which Small-Scale Testing used full-height columns while Large-Scale Testing used half-column columns.
   (circle) TRUE FALSE

6. Through the experiments, the ECC specimen without seismic details showed higher moment capacity and higher ductility than concrete specimen with seismic detailing.
   (circle) TRUE FALSE

QUIZ 04-08 CONTINUED

7. What of the following could be the objectives of Large-Scale Experimental Program
   I. Determine reversed cyclic load response of proposed system.
   II. Evaluate 2 ECC mixes in place of concrete in hinge regions.
   III. Compare seismic detailing of concrete with ECC.
   IV. Evaluate effect of ECC hinge segment length.
   a) I, II.
   b) I, II, III, IV.
   c) II, III.
   d) II, III, IV

8. The main procedure for Performance-based Earthquake Engineering Methodology: Select ground motion → Analyze system response (nonlinear dynamic analysis) → Performance assessment (crack widths, spalling) → Evaluate Cost/Downtime. (circle) TRUE FALSE

9. For development of fragility information on new bridge pier system, which of the following is numerical modeling based?
   a) Reversed cyclic load response of ECC.
   b) Monotonic load response of ECC.
   c) Reversed cyclic load response of HPFRCC.
   d) Monotonic load response of HPFRCC.

10. In Small-scale Post-tensioned Column Tests, what of the following are the components of the specimen
    I. Post-tensioning
    II. Concrete Segments
    III. ECC Segment
    IV. Stiff angles for fixed base
    a) I, II.
    b) I, II, III, IV.
    c) I, II, III.
    d) II, III, IV.

11. To simulate the un-bonded post-tensioned bridge pier with ECC segment, Prof. Billington and her research group use 2D non-linear plane stress model for concrete and ECC models, considering embedded reinforcement included within segments, and use cyclic load to 4% drift.
    (circle) TRUE FALSE

12. For assessment of proposed bridge pier system, the fragility of onset of concrete crushing relative to drift ratio at 1.5% is:
    a) Around 0.5.
    b) Around 0.3.
    c) Nearly 1.0.
    d) Around 0.7.

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