



University of Technology
Building and Construction Eng. Dept.
Final Exam — 2010/2011



Subject :Highway Specifications & maintenance Class: 4th

Branch :Highway & Bridge Eng.

Time : 3 Hours

Examiner :Dr.Hasan Hamodi Joni

Date : 05 / 06 / 2011

Note: Answer Five questions only

Q1) Explain Four only from the following items :

A-Resurfacing the flexible pavement by recycling?

B-Jacks and anchorages for prestressing according to prestressing for structures section of specifications?

C- What are the requirements of application for bituminous tack coat?

D-The unsuitable materials that cannot be used in earthworks according to the specifications?

E- If the inspection of bores for cylinder foundation proves to be unsatisfactory, what are the contractor's responsibility?

Q2)A-For such project of reinforced concrete pipe culverts across a highway where the required culverts of (90cm) diameter. The contractor supply a pipe culvert of (85cm) diameter with water absorption test results of pipe concrete of 8%. Explain if can be accept this pipe culvert or reject and why?

B- What are the reasons lead to pavements fail prematurely? Explain one of them in details?

C-Discuss thickness, finish and surface regularity for smoothness of pavement course?

Q3)A-For any highway construction project. What are the required works for maintenance of traffic that must be done by the contractor?

B-Define the disintegration distress in flexible pavement? Explain the types of disintegration with causes and remedies?

Q4) A-Answer by True or False and correct the false statement for the following:

I-Polishing distress defined as a one type of surface deformation distresses in flexible pavement.

II-Drains for foul water and cement mortar joint pipes for surface water up to and including 45cm diameter shall be tested by means of a smoke test before they are covered up.

III-Hand laying of any asphalt material will be permitted for footways only.

IV-Thin wearing courses are considered preventive maintenance, and are expected to provide structural support to pavement.

V-For structural concrete, the amount of sulphates in the mass of the concrete shall not exceed 4.5% of the weight of cement in the concrete.

B-List with brief description the materials used for waterproofing the structures?

Q5)A-For such project of roadway asphalt pavement(binder course type),where the designed job mix formula as follow:

| Sieve No. | 1 | 3/4 | 1/2 | 3/8 | No.4 | No.8 | No.50 | N0.200 | Asphalt Cement% |
|-----------|-----|-----|-----|-----|------|------|-------|--------|--------------------|
| | in. | in. | in. | in. | | | | | |
| %passing | 100 | 100 | 82 | 69 | 44 | 31 | 19 | 4.5 | 5.1 |

What are the job mix formula tolerances according to the specifications?

B-Compare between the slurry seal and chip seal as a types of thin wearing courses?

Q6)A-What are the requirements for preparation of formwork before concreting according to the specifications?

B-What are the four steps required for embankment area preparation?

C-What are the causes that developing a bleeding distress in flexible pavement? what are the required remedies for this type of distresses?

GOOD LUCK

TABLE R9/3
ASPHALT MIXTURE GRADINGS

| Sieve size | mm | Type I | Type II | Type IIIA | Type IIIB |
|---|-------------|-------------|---------------------------|---------------------------|-----------|
| | | Base Course | Binder or Leveling Course | Surface or Wearing Course | |
| % Passing by Weight of Total aggregate + Filler | | | | | |
| 1 1/2 in | 37.5 | 100 | | | |
| 1 | 25.0 | 90-100 | 100 | | |
| 3/4 | 19.0 | 76-90 | 90-100 | 100 | |
| 1/2 | 12.5 | 56-80 | 70-90 | 90-100 | 100 |
| 3/8 | 9.5 | 48-74 | 56-80 | 76-90 | 90-100 |
| No. 4 | 4.75 | 29-59 | 35-65 | 44-74 | 55-85 |
| No. 8 | 2.36 | 19-45 | 23-49 | 28-58 | 32-67 |
| No. 50 | 300 μ m | 5-17 | 5-19 | 5-21 | 7-23 |
| No. 200 | 75 μ m | 2-8 | 3-9 | 4-10 | 4-10 |
| Asphalt Cement (% weight of total mix) | | 3-5.5 | 4-6 | 4-6 | 4-6 |

The aggregate as finally used in the work shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, but shall be uniformly graded.

R9 04 JOB-MIX FORMULA

No asphalt concrete mixture shall be manufactured until a job-mix formula has been submitted by the Contractor and approved by the Engineer's Representative. The formula shall indicate the exact percentage of each sieve fraction and the exact percentage of bitumen to be used in the mixtures and the mix temperature. The Contractor will be allowed the tolerances from the approved job-mix formula shown in Table R9/4.

TABLE R9/4
JOB-MIX FORMULA TOLERANCES

| | Tolerance |
|---|--------------------------|
| Aggregate passing sieve 4.75mm (No.4) or larger | $\pm 6\%$ |
| Aggregate passing sieve 2.36mm (No. 8) to 0.3mm (No.50) | $\pm 4\%$ |
| Filler passing sieve 0.075mm (No. 200) | $\pm 2.0\%$ |
| Asphalt cement | $\pm 0.3\%$ |
| Mix temperature | $\pm 15^{\circ}\text{C}$ |

The asphalt concrete mixtures shall have the properties shown in Table R9/5 when compacted by 75 blows of a standard Marshall hammer on each face.