



Question 1

(25 marks)

- 1- Mention the different types of Asphalt? Explaining them in details?
- 2- Talk about the physical properties of asphalt?
- 3- Discuss in details the asphalt modifiers?
- 4- Compare between :
  - a) Seal coat and prime coat.
  - b) Saybolt furol viscosity and Engler's viscosity test.
  - c) Penetration test and softening point test.
  - d) Surface layer and binder layer.
- 5- Discuss the following tests:
  - a) Ductility test
  - b) Flash point test
  - c) Solubility test
  - d) Specific gravity test

Question 2

(25 marks)

- 1- What are the differences between: fatigue cracking and thermal cracking?
- 2- What are the objectives and components of Superpave program?
- 3- Discuss the following:
  - The rutting in asphalt layer.
  - The moisture damage of asphalt mixtures
- 4- Talk about the self-healing asphalt?
- 5- Explain the following Superpave tests of asphalt sample clearing the purpose of each test, sample preparation, and test performing:
  - a) Rolling Thin Film Oven (RTFO)
  - b) Dynamic Shear Rheometer (DSR)
  - c) Binding Beam Rheometer (BBR)
  - d) Direct Tension Test (DTT)

Question 3

(25 marks)

- 1- Discuss in details the following methods for asphalt mixtures design:  
Hveem Method, Marshall Method, Superpave Method
- 2- Define the rubberized asphalt? Illustrating advantages? Disadvantages? And its uses in practical cases?
- 3- Compare between: Foamed (Expanded) asphalt and Air blowing asphalt?
- 4- Talk about the methods for improving the characteristics of bituminous materials?
- 5- Talk about the effect of additives and other factors on tensile strength of asphalt paving mixtures?
- 6- Discuss the effect of the filler and different modifiers on the adhesion properties between the asphalt and aggregate?

Question 4

(25 marks)

- 1- Talk about the Polymer additives in Asphalt mixtures such as SBR and SBS?
- 2- Discuss the determination of approximate value of bitumen content in Marshall design method?
- 3- Talk about "raveling"? illustrating its reasons and solutions?
- 4- Define and illustrate the factors that affect on:
  - a) Stability
  - b) Durability
  - c) Flexibility
  - d) Skid resistance
  
- 5- A particular aggregate combination used in asphalt mix contains 40% coarse aggregate ( $G_s = 2.64$ ), 53% fine aggregate ( $G_s = 2.80$ ) and 7% filler ( $G_s = 2.86$ ). The asphalt cement of ( $G_s = 1.03$ ) was used by 6% from the weight of total mixture. The weight of mixture in air = 1225 gm and 670 gm in water calculate:
  1. The percent of voids in compacted mineral aggregates?
  2. The theoretical specific gravity of the compacted specimen?

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*With my best wishes*  
*Dr. Ahmed Abu El-Maaty*