



Question 1

(25 marks)

1. What are the generally characteristics of bituminous?
2. Explain in details the different types of asphalt? illustrating the different sources of it?
3. What is tar and what is pitch? clarifying which one is more purity?
4. What is the meaning of the following:- (AC 60/70 , SC-200 , RT 4 , MC-70)
5. What are the advantages and disadvantages of traditional methods of mix design (Marshall & Hveem)?
6. Discuss the following tests:
 - a. ductility test
 - b. flash point test
 - c. solubility test
 - d. volatility test
7. Discuss with sketch
 - a. penetration test
 - b. ductility test
 - c. float test
 - d. softening point test

Question 2

(25 marks)

1. Talk about Cut back asphalt and Asphalt cement?
2. Explain briefly asphalt behavior as a function of its chemical?
3. Talk briefly about the bituminous properties?
4. Discuss the air blowing asphalt (definition, uses, advantages and disadvantages)?
5. Discuss the foamed Asphalt (definition, uses, advantages and disadvantages)?
6. Talk about (lime filler) modifiers?
7. Discuss the rubber asphalt (definition, uses, advantages and methods of producing)?
8. Mention the rubber asphalt tests? explain two of rubber asphalt tests briefly?

Question 3

(25 marks)

1. 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)
2. Discuss the effect of additives in hot asphalt mixtures?
3. Discuss modification of asphalt mixture performance by rubber-silicone additive?
4. Talk about mineral filler?
5. Describe the difference between the bonding layer and the surface in terms of the properties of the materials used in each?
6. Explain briefly asphalt behavior as a function of its physical constituents?

Question 4

(25 marks)

1. Talk about the self-healing asphalt? illustrating the methods of self-healing?
2. What are self-healing materials and its types?
3. The grain size analysis of an aggregate is as the following :

Sieve NO.	4	10	40	60	100	200
% passing	60	56	30	19	13	10

If the previous aggregate used in a surface mixture, determine the approximate value for bitumen content in the mixture?

4. A specimen of asphalt its weight in air and water were 1205 and 691 gm respectively the proportion of the mix as follow:

Material	Specific gravity	% by weight
Asphalt cement	1.03	4
Lime stone aggregate	2.77	20
Sand	2.86	80
Filler	2.92	6

Calculate:

- a) The bulk density of the specimen.
- b) The present of air voids in the specimen.
- c) The present of voids in compacted mineral aggregate.
- d) The present of voids in the aggregate that filled with asphalt.
- e) The theoretical density of the mix.
- f) Find the relative density of a compacted pavement constructed from the above mix if the core taken from the pavement weight 3470 gm in air and 2005 gm in water.

With my best wishes
Dr. Ahmed Abu El-Maaty

This exam measures the following ILOs (Intended Learning Outcomes)

Question No.	ILOs
1	A-1, A-2, B-3, C-2, D-7
2	A-3, B-4, B-5, C-1, C-2, D-3, D-6
3	B-4, B-5, A-4, D-4, C-1
4	A-2, C-3, B-4, D-5, C-2