Menoufia University

Faculty of Engineering

Shebin El-Kom

Department: Mechanical Power Eng.

Total Marks: 100 marks



Subject: Air Pollution

Code : MPE628 Level: Master

Time Allowed: 3 hours Date of Exam: 4/6/2018

This exam measures ILOS no.: (A6, A11, A18), (B5, B9, B10), (C15), (D1, D2)

Answer	the	follo	owing	q	uestions:
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Question (1)

(28 marks)

- a- What are the design and operating variables which may increase the formation of NO_x and UHC in the exhaust of SI engine? (8 marks)
- b- What are the effects of the following variables on CI engine exhaust emissions:
 - 1- injecting timing
- 2- fuel air ratio

3- Cetan number

- 4- intake air charge dilution (8 marks)
- c- What are catalytic converters? How are they helpful in reducing HC, CO, and NOx emissions? What the effect of equivalence ratio on its conversion efficiency?

(8 marks)

d- What are the knock emissions and how they are formed? What are their effects on environment? (4 marks)

Question (2)

(26 marks)

a- What do we mean by environmental pollution? Mention the different sources of environmental pollution? Explain its harmful effect on elements of environment?

(8 marks)

- b-What do you understand by the term EGR? Explain how EGR reduces NO_x emission. (6 marks)
- c- Describe the working principle of a Bosch smoke-meter? (6 marks)
- d-With a neat sketch explain the effect of equivalence ratio on HC, CO, and NO, emissions for a four stroke direct injection diesel engine. (6 marks)

Question (3)

(21 marks)

- a- What are the objectives of a particulate trap? Describe the methods of the regeneration of the trap? (8 marks)
- b- With the help of a schematic diagram explain the working principle and operation of an analyzer used for measuring the concentration of carbon dioxide.

How is this analyzer calibrated?

(8 marks

c- What are the problems created by exhaust emissions?

(5 marks)

Question (4)

(25 marks)

- a- Differentiate in detail between thermal and catalytic converters? How do they help to reduce emissions from engines? (8 marks)
- b- Explain briefly the following terms:
 - 1- Blow-by emissions
- 2- SOF (Soluble Organic Fractions)
- 3- Non-exhaust emissions
- 4- Light-off temperature

(8 marks)

c- What is technique used in the measurement of particulates?

(4 marks)

d- Describe the working principle of the FID gas analyzer with the help of a schematic diagram. How is this analyzer calibrated? (5 marks)

With my best wishes

Dr. Zaber Asar