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Question Paper Code : 72128

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Eighth Semester

Mechanical Engineering

ME 6016 — ADVANCED IC ENGINES

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the method used to detect the phenomenon of knocking.
2. List the various types of combustion chambers used in S.I engines.
3. What is turbo charger and super charger?
4. What is ignition delay period?
5. What are soot particles? Give its typical size.
6. Write down zeldovich mechanism of NO formation.
7. Write any two merits and de-merits of using Hydrogen as fuel in IC engine?
8. What are the engine modifications required to use compressed natural gas (CNG) as fuel?
9. Write any two merits and demerits of the stratified charge engine.
10. How HCCI engines achieves simultaneous reduction in NO_x and particulate matter (PM) emissions?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the stages of combustion in S.I engine with a $p - \theta$ diagram.

Or

- (b) Explain the working of multi - point and gasoline direct injection systems used in S.I engines with block diagram.

12. (a) (i) Give the detailed comparison of combustion phenomenon in C.I engine and S.I engine. (8)
- (ii) Give the detailed comparison of knock in C.I and S.I engines. (8)

Or

- (b) Describe diesel fuel spray behavior and spray structure with neat sketch.
13. (a) (i) Discuss the mechanism of formation of HC, CO and NO in S.I engine. (10)
- (ii) What is Indian driving cycle? What is the procedure adopted for it? Explain. (6)

Or

- (b) Discuss the working of selective catalytic reduction (SCR) and particulate traps with neat sketch.
14. (a) Compare the fuel properties of Diesel, petrol, Bio diesel and LPG.

Or

- (b) (i) Discuss the methods of using alcohol as fuel in S.I and C.I engines. (10)
- (ii) Explain the emission characteristics of using hydrogen in a C.I engine. (6)
15. (a) Explain the construction and working of Common Rail Direct Injection (CRDI) system with neat block diagram.

Or

- (b) Discuss the following (i) Hybrid Electric Vehicle (HEV) and (ii) On-Board Diagnostics (OBD).

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Reg. No. :

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Question Paper Code : 41373

02/05/18

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B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Eighth Semester

Mechanical Engineering

ME 6016 – ADVANCED I.C. ENGINES

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. Distinguish between multipoint fuel injection and GDI system.
2. List the types of combustion chambers used in SI engine.
3. Define the term turbocharging.
4. Define the terms swirl and squish.
5. Why reduction catalyst is placed before the oxidation catalyst in a three way catalytic converter ?
6. How formation of oxides of nitrogen occurs in an IC engine ?
7. Write the features of Biodiesel fuel.
8. List merits and demerits of alcohol fuels.
9. Why CRDI is preferred over mechanical fuel injection system ?
10. Define the term Hybrid Electric Vehicle.

PART – B

(5×16=80 Marks)

11. a) Explain the working of MPFI and GDI system with neat sketch. (16)
- (OR)
- b) Describe the phenomenon knocking in SI engine and the factors affecting knocking in SI engine. (16)

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12. a) Discuss about the functions, requirements and types combustion chambers used in CI engine with neat sketch. (16)

(OR)

b) Explain the stages of combustion in CI engine with pressure-crank angle and heat release rate diagram. (16)

13. a) Discuss about formation of oxides of nitrogen and particulate matter in Diesel engines. (16)

(OR)

b) Elucidate the working, design features of SCR and Diesel Particulate Filters with neat sketch. (16)

14. a) Discuss about the methods of using alcohol fuels in IC engines. (16)

(OR)

b) Explain the methods of using CNG and hydrogen in Diesel engines. (16)

15. a) With a neat schematic layout explain the working of common rail direct injection system and write the merits of CRDI over Mechanical fuel injection system. (16)

(OR)

b) Detail about methods of achieving HCCI combustion mode in CI engines and list the challenges and advantages of HCCI combustion. (16)

Reg. No. :

Question Paper Code : 53293

16-4-19

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B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Eighth Semester

Mechanical Engineering

ME 6016 — ADVANCED I.C. ENGINES

(Regulation 2013)

(Common to PTME 6016 – Advanced IC Engineering for B.E. Part-Time for Seventh Semester – Mechanical Engineering – Regulation 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. With pressure-crank angle diagram mark the normal and abnormal combustion process.
2. Draw any two types of SI combustion chamber write its any two special features.
3. Define the term compression ignition and state how it differs from spark ignition.
4. Mark the stages of combustion of CI engine on heat release rate diagram.
5. State the reason for formation of carbon monoxide during combustion.
6. Draw the Indian driving cycle.
7. Define the term Biodiesel and write the name of the process through which Biodiesel is produced.
8. Ethanol or Methanol which is better for IC engine?
9. Why CRDI system is more flexible than mechanical fuel injection system?
10. State the need of hybrid electric vehicles.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the various stages of combustion in SI engine with pressure-crank angle diagram.
- Or
- (b) Discuss about the function and requirements of SI engine combustion chamber and explain the different types of combustion chambers used in SI engine with neat sketch.
12. (a) Explain the occurrence of knocking in CI engine and the factors that are influencing CI engine knock.
- Or
- (b) Discuss the methods of improving volumetric efficiency in CI engine and explain how turbocharging improves volumetric efficiency and methods of turbocharging.
13. (a) Explain the construction and working of three-way-Catalytic converter with neat sketch.
- Or
- (b) Describe the formation of oxides of nitrogen and particulates and explain the NO_x-PM trade-off in diesel engine.
14. (a) Show the modifications required to use hydrogen as a fuel in SI engine, state the functions of each modification and benefits of hydrogen over gasoline fuel.
- Or
- (b) Present an overall comparative discussion about alternative fuels in terms of its usage, benefits, sustainability, modifications and performance.
15. (a) Explain the working of common rail direct injection system with neat sketch and compare with mechanical fuel injection system.
- Or
- (b) Explain the fundamental differences in combustion principle between CI and HCCI combustion and how HCCI method breaks the NO_x-PM trade-Off?

PART C — (1 × 15 = 15 marks)

16. (a) Discuss in detail about the promises and challenges exist in biodiesel production, sustainability and utilisation in IC engines.
- Or
- (b) Present a discussion about the evolution or development pathway of SI engine.



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Question Paper Code : 50842

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Eighth Semester

Mechanical Engineering

ME 6016 – ADVANCED I.C. ENGINES

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. List some fuel requirements for a SI engine.
2. Mention the type of fuel injection system commonly utilised in a SI engine.
3. Define swirl and squish.
4. Define ignition delay.
5. List out the major pollutants from a CI engine exhaust.
6. What is the use of driving cycle ?
7. What is LPG ? State its chief constituent.
8. Write any two merits of alcohol as a fuel for SI engines.
9. What is HCCI ?
10. State the necessity of onboard diagnostics.

PART – B

(5×16=80 Marks)

11. a) i) Explain the stages of combustion in a S.I. engine with the help of a pressure-crank angle diagram. (8)
- ii) Define knocking in a SI engine and also discuss about the factors responsible for knocking. (8)

(OR)

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- b) i) Draw a schematic of different SI engine combustion chambers and their characteristics. (10)
- ii) Draw a schematic of direct injection system in a SI engine. (6)

12. a) i) Discuss the significance of air-motion in a CI engine. Also define and mention the significance of swirl, tumble and squish. (3+7)
- ii) Depict atleast two types of modern day CI engine combustion chamber shapes. (3+3)

(OR)

- b) Discuss with suitable illustration the fuel spray structure, behaviour and its penetration through air stream inside the combustion chamber of a CI engine. (16)

13. a) Describe the construction and working of a three way catalytic converter with the help of a schematic. (16)

(OR)

- b) Explain with neat sketch i) Chemiluminescence's method of measuring oxides of nitrogen ii) FID method of measuring carbon monoxide. (16)

14. a) i) What are the advantages and disadvantages of using Bio-Diesel in CI engine ? (8)
- ii) List the merits and demerits of using alcohol as neat fuel in SI engines. (8)

(OR)

- b) i) Explain with an illustration the functioning LPG fuelled SI engine. (8)
- ii) Compare any five properties of ethanol, Liquefied Petroleum Gas and Compressed Natural gas. (8)

15. a) i) Describe the concept of a HCCI system with a schematic. (11)
- ii) Draw a schematic of a hybrid electric vehicle. (5)

(OR)

- b) i) Describe the operation of a common rail direct injection system with an illustration. (10)
- ii) What is a variable geometry turbocharger ? Discuss its functioning with a schematic. (6)

Reg. No. :

Question Paper Code : 20796

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Eighth Semester

Mechanical Engineering

ME 6016 — ADVANCED IC ENGINES

(Regulations 2013)

(Common to PTME 6016 — Advanced I.C. Engines for B.E. (Part-Time) – Seventh Semester – Mechanical Engineering – Regulations 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the types of injection systems used in SI engines.
2. List two merits of a fuel injection system as compared to a carburettor.
3. What is turbocharging? Is it advantageous for a CI engine?
4. List some major components of a Diesel fuel direct injection system.
5. What is selective catalytic reduction? It is used to control which pollutant?
6. Mention the current emission norm followed in metropolitan cities in India.
7. List atleast two properties of LPG.
8. What are the merits of alcohol as a fuel for SI engines?
9. What is unique about HCCI combustion?
10. What is a hybrid electric vehicle? Give an example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the port fuel injection system in a SI engine with a schematic. (10)
 (ii) Draw the wall guided mode of direct injection combustion chamber for a SI engine. (6)

Or

- (b) (i) Draw a schematic of different SI engine combustion chambers and their characteristics. (10)
 (ii) List the nominal air-fuel ratios in a SI engine during cold start, cruising, idling and acceleration. (6)
12. (a) (i) Describe with p-theta diagram how air-fuel mixture burns in a CI engine. (10)
 (ii) Depict atleast two types of modern day CI engine combustion chamber shapes. (3+3)

Or

- (b) How does a fuel spray interact with surrounding air in a CI combustion chamber? Support your detailed answer with suitable sketches. (8+8)
13. (a) Explain the sources and mechanism of formation of oxides of nitrogen in a SI engine. How they can be controlled? (16)

Or

- (b) (i) Briefly discuss about selective catalytic reduction process with a suitable sketch. (8)
 (ii) What is a driving cycle? Explain its significance with a schematic. (8)
14. (a) (i) List the parameters which makes ethanol a suitable fuel for SI engine and compare any four of its properties with gasoline. (4+4)
 (ii) Mention atleast four properties of Hydrogen and natural gas. (4+4)

Or

- (b) (i) Give the suitability of LPG as a fuel for a CI engine. (6)
 (ii) Mention the merits and demerits of alcohol as fuel for CI engine. (10)

15. (a) (i) Describe the functioning of a hybrid electric vehicle with a schematic. (10)
 (ii) What are NOx adsorbers? Briefly discuss about its characteristics. (6)

Or

- (b) (i) Describe the operation of a common rail direct injection system with an illustration. (10)
 (ii) What is on Board Diagnostics? Discuss its functioning with a schematic. (6)



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Question Paper Code : 91828

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Eighth Semester

Mechanical Engineering

ME 6016 – ADVANCED I.C. ENGINES

(Regulations 2013)

(Common to PTME 6016 Advanced I.C. Engines for B.E. (Part-Time) –
Seventh Semester – Mechanical Engineering – Regulations – 2014)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. Define abnormal combustion.
2. Classify the factors that are involved in either producing (or) preventing knock.
3. List the factors affecting the delay period.
4. What are the major parts of a turbocharger ?
5. Summarize the causes for hydrocarbon emission from S.I. engine.
6. What is photochemical smog ?
7. List the feed stocks for production of methanol.
8. Mention the techniques for fuelling SI engines with hydrogen.
9. Why lean mixture is preferred in SI engine ?
10. What are the fuels used in HCCI engines ?

PART – B

(5×13=65 Marks)

11. a) Explain how the power and efficiency of the SI engine vary with air-fuel ratio for different load and speed conditions ?

(OR)

- b) Elaborate on the stages of combustion in SI engines.

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12. a) Detail the techniques adopted for controlling diesel knock.

(OR)

b) List and explain the various types of combustion chambers employed in CI engines.

13. a) Describe in detail about the effects of hydrocarbon emissions on environment.

(OR)

b) i) Explain the formation of particulate matters in diesel engines. (8)

ii) Present the option available for reducing emission of particulate matters. (5)

14. a) Compare any 4 fuel related properties of LPG, CNG and Hydrogen with that of diesel.

(OR)

b) Discuss the change in properties of alcohol-petrol blends and their effect on the performance of the engine.

15. a) With a neat sketch explain the working of a series and parallel hybrid electric vehicle.

(OR)

b) With a neat sketch explain the working of Common Rail Direct Injection Diesel Engine.

PART - C

(1×15=15 Marks)

16. a) Scientifically Justify "The best fuel for a SI engine is the worst one for CI Engine".

(OR)

b) Discuss the importance of hybrid vehicles in India.