Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B.E.
Year : IV
Course : MEPP 433
Semester: II

Exam Roll No. :
Time: 30 mins.
F. M. : 20

Registration No.:
Date : JUL 0 9 2017

SECTION "A"
[10 Q.×1=10 marks]

Choose the most appropriate answer/s.

1. The signal of the cylinder pressure obtained from a sensor as electric charge, is converted into recordable voltage signal by using a
[ ] Piezo-electric sensor [ ] voltage amplifier [ ] charge amplifier [ ] data acquisition card

2. The stoichiometric air fuel ratio for gasoline combustion is the order
[ ] 6:1 [ ] 10:1 [ ] 12:1 [ ] 15:1

3. The combustion duration in a spark ignition engine in terms of crank angle _____ with increasing engine speed and turbulence.
[ ] increases
[ ] decreases
[ ] becomes difficult to predict
[ ] remains constant

4. The laminar flame speed of methane at atmospheric conditions is at the order of
[ ] 0.5 m/s [ ] 2.5 m/s [ ] 25 m/s [ ] 0.05 m/s

5. The use of air-box in the intake side of an experimental set-up is used to
[ ] reduce the pressure of air intake
[ ] regulate the air pressure
[ ] dampen the pulsating air flow
[ ] regulate the amount of air

6. _____ lowers the temperature and pressure at the beginning of expansion stroke in a spark ignition engine
[ ] air-fuel ratio [ ] specific heat ratio [ ] turbulence [ ] dissociation

7. The non-methane hydrocarbon emission is significantly harmful because of
[ ] global warming potential
[ ] role in the formation of ozone
[ ] carcinogenic effects
[ ] fatal toxicity

8. The PAH which is 'probably carcinogenic to humans', is
[ ] naphthalene
[ ] benzo[a]pyrene
[ ] benzo[g,h,i]perylene
[ ] benzo[k]fluoranthene

9. The biggest contributor to the total hydrocarbon emissions from an s. i. engine is
[ ] oil layer [ ] deposits [ ] liquid fuel [ ] crevices

10. The mass fraction burned curve in a spark ignition engine _____ with advancing spark timing
[ ] becomes more steep
[ ] becomes less steep
[ ] remains the same
[ ] approaches to 1

SECTION "B"

[10 Q.× 1=10 marks]

Fill in the blanks.

11. The oxides of nitrogen from an engine exhaust is measured using _____ detector.

12. The practical combustion temperature is highest at _____ condition.

13. Rank petrol, diesel and kerosene in terms of decreasing self ignition temperature

    i._____ ii. _____ iii. _____

14. The finite heat release curve can be modeled by using Weibe function expression as

    _____

15. The high swirl multi-spray is used in _____ diesel engines.

16. Full form of NDIR is _____

17. For compounds of same carbon number, order of increasing boiling point by class (n-paraffin, isoparaffin, aromatic, and naphthene) is

    i._____ ii. _____ iii. _____iv._____

18. Aldehyde emission is significant from _____

    _____

19. NO emission from an s. i. engine is highest at _____ fuel-air equivalence ratio.

20. If the start of the combustion process is progressively advanced before TDC, the

    _____ increases.

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Time : 2 hrs. 30 mins.

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F. M. : 55

SECTION "C"
(Long answer questions)
[5Q × 7 = 35 marks]

Attempt *ALL* the questions.

1. What are catalytic converters? Explain the working principle of a three-way catalyst with its types. Describe the behavior of conversion efficiency with respect to the equivalence ratio.

2. Explain how a computer model for an i. c. engine can be developed based on simple thermodynamic relations. What happens when fuel air properties are fitted into the model? What is the importance of the coefficients specific heat curve for the computer model as opposed to the data of the ratio of specific heat with temperature?

3. Why do we need engine experimental set-up? Describe a basic set-up using a simple schematic diagram. Explain an NDIR apparatus and chemiluminescent apparatus for the measurement of exhaust gas.

4. What is knock phenomenon? What are the types of knock occuring in a spark ignition engines? Explain the various types of knock.

5. Write a short technical essay on various pollutant formation mechanism in a spark-ignition engine.

SECTION "D"
(Short answer questions)
[4Q × 5 = 20 marks]

Attempt *ANY FOUR* questions. Be precise and to the point. Writing unnecessarily lengthy answer may not fetch maximum marks.

6. Describe how knock in a spark ignition engines measured.

7. What would be the effects of operating conditions like initial air temperature, injection pressure and swirl in the various stages of heat release of a direct injection diesel engines?

8. Explain why a hydrocarbon fuel like gasoline does not have a fixed boiling point. Explain the distillation (boiling) curve of hydrocarbon fuels by sketching those curves for gasoline, kerosene and diesel. Explain using the same sketch what may happen to the curve when we mix kerosene with gasoline.

9. Why is turbulent flame speed so important for proper operation of modern internal combustion engines? Is high speed of combustion helpful in relation to s. i. engine knock? Why?

10. Explain with sketch the difference between a pV diagram of an Otto cycle and an indicator diagram of a spark ignition engine working at the same compression ratio. Explain the reason for the differences.