KATHMANDU UNIVERSITY
End Semester Examination
March/April 2017

Marks scored:

Level : B.E.
Year : IV

Course : MEPP 433
Semester: I

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

Registration No.: Date :

SECTION "A"
[8 Q.×1=8 marks]

Choose the most appropriate answer/s.

1. The oxide of nitrogen from an engine exhaust is measured using
   [ ] NDIR [ ] piezo sensor
   [ ] chemiluminescence [ ] UV fluorescence

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

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

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

5. The practical combustion temperature is highest at ϕ = _____
   [ ] 0.9 [ ] 1 [ ] 1.1 [ ] 0.8

6. The working cycle in the case of a four stroke engine is completed in the following revolution of crankshaft
   [ ] 1/2 [ ] 1 [ ] 2 [ ] 4

7. Quiescent combustion system is used in
   [ ] large sized D.I. diesel engines [ ] small sized I.D.I. diesel engines
   [ ] small sized D.I. diesel engines [ ] largest D.I. diesel engines

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

SECTION "B"

[12 Q.×1=12 marks]

Fill in the blanks.

9. Laminar burning velocity of most of the hydrocarbon fuels in STP is about _____ m/sec

10. If the compression ratio of the engine working on Otto Cycle is 10:1, its thermal efficiency will be _____

11. Rank the efficiency of otto, diesel and dual cycles with the same compression ratio

    i._____ ii._____ iii. _____

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

13. The _____ method is used to measure knock intensity when low resolution data (e.g. 1 data/crank angle) is available.

14. One of the PAHs that is probably carcinogenic in human is _____

15. _____ emission is significant from spark ignition engines when alcohol blends are used.

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

17. _____ emission is significant in spark ignition engines compared with diesel engines.

18. _____ emission in any combustion increases with equivalence ratio at lean side, becomes maximum at $\phi = 1$ and decreases as the mixture becomes richer.

19. The expression for mean effective pressure is _____

20. Back work increases with _____ spark timing.

KATHMANDU UNIVERSITY
End Semester Examination
March/April 2016

Level : B.E.
Year : IV
Time : 2 hrs. 30 mins.

Course : MEPP 433
Semester: I
F.M. : 55

SECTION "C"

Long answer questions. *Attempt ALL the questions. Each question carries 7 marks.*

1. Explain how net heat release rate and mass fraction burned are computed from cylinder pressure data.

2. What is knock phenomenon? What are the types of knock occurring in a spark ignition engines? Explain the various factors that affect knock.

3. Write a short technical essay on polycyclic aromatic hydrocarbons emissions from i. c. engines. Include health effects, distribution in the atmosphere, formation mechanism etc. in the essay.

4. i. Explain the combustion phenomenon occurring in an direct injection diesel engines. What happens to the combustion if the ignition delay is prolonged and combustion chamber swirl is enhanced? [5]

   ii. Describe the application of direct injection and indirect injection diesel engine with specific reference to the size and speed of the engine. [2]

5. i. What are various types of flames occurring in spark ignition and compression ignition engines? What are the characteristics and implication of those flames in relation to those engines? [3.5]

   ii. Explain how the intensity of knock is measured. [3.5]

SECTION "D"

Short answer questions. *Attempt ALL the questions. Be precise and to the point. Writing unnecessarily lengthy answer may not fetch maximum marks. Each question carries 5 marks.*

6. Explain the hydrocarbon emission formation mechanism from an s. i. engine. Elaborate the effect of fuel properties in the hydrocarbon emissions from an engine both in terms of amount and species?

7. What is a finite heat release model? How it differs from the more simper Otto cycle model? What could be added to make the finite heat release model to better represent real engine cycle?

8. Explain the reason for maintaining the air-fuel ratio close to stoichiometric condition in a gasoline engines when 3-way catalytic converter are used?

9. Describe the working of a chemiluminescence based equipment for the measurement of NO and NO_2.