

Special
November, 2017

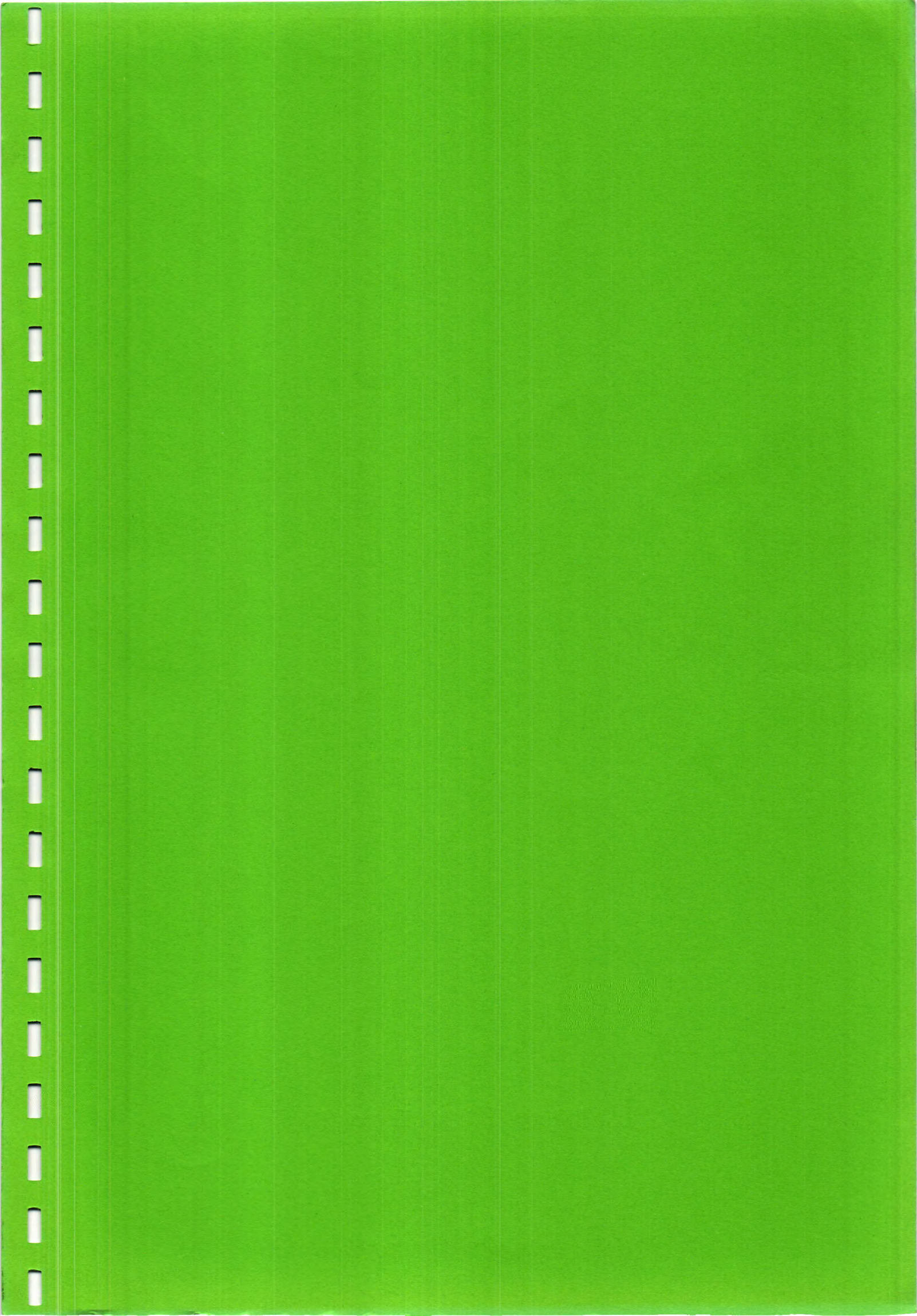
KATHMANDU UNIVERSITY
End Semester Examination [C]
January 2018

Marks scored:

Level : B. E.
Year : IV

2017 - II Sem. & Special.

Course : MEPP 433
Semester: I



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Marks scored:

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Exam. Roll No.:

Time: 30 mins.

F. M. : 20

Registration No.:

Date JAN 12 2018

SECTION "A"

[10 Q.×1=10 marks]

Choose the most appropriate answer/s.

1. NO emissions from an s.i. engine is highest at
 stoichiometric air-fuel ratio slightly lean condition
 slightly rich condition very rich condition
2. The biggest contributor to the total hydrocarbon emissions from an s. i. engine is
 oil layer deposits liquid fuel crevices
3. The PAH which is 'probably carcinogenic to humans', is
 naphthalene benzo[g,h,i]perylene
 benzo[a]pyrene benzo[k]fluoranthene
4. The stoichiometric air fuel ratio for gasoline combustion is the order
 10:1 12:1 15:1 18:1
5. The working cycle in the case of a four stroke engine is completed in the following revolution of crankshaft
 1/2 1 2 4
6. The maximum temperature in the i.c. engine cylinder is of the order of
 1000-1500 1500-2000 2000-2500 2500-3000
7. 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
8. High swirl multi-spray 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

SECTION "B"

[12 Q.×1=12 marks]

Fill in the blanks.

9. The difference between indicated power and brake power represents

10. Aldehyde emission is significant from

11. For compounds of same carbon number, order of increasing boiling point by class (n-paraffin, isoparaffin, aromatic, and naphthene) is
 i. _____ ii. _____ iii. _____ iv. _____
12. Flame development and subsequent propagation in an engine vary cycle by cycle because of the variation in charge motion and _____.
13. The precursors for the formation of PAH and subsequently, the particulate matter in a combustion process are _____ and _____
14. The laminar flame speed of most hydrocarbon fuels in atmospheric conditions is in the range of _____ m/s
15. Rank petrol, diesel and kerosene in terms of decreasing self ignition temperature
 i. _____ ii. _____ iii. _____
16. If the compression ratio of the engine working on Otto Cycle is 10:1, its thermal efficiency will be _____
17. Weibe function, by which the finite heat release in an engine is modelled, can be as expressed as _____
18. An important information that we get from the fuel-air cycle analysis that by leaning the fuel-air mixture _____ the efficiency.
19. If the start of the combustion process is progressively advanced before TDC, knocking tendency increases because of _____.
20. The *practical* combustion temperature is highest at _____ fuel-air equivalence ratio.

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JAN 12 2018

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

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

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

Attempt all the questions.

1. What is knock in an s. i. engine? How can it be controlled by spark timing? Explain in detail the various factors that govern knock.
2. Describe how the pressure measurement is done in an engine experimental set-up. Explain various types of knock measurement using engine pressure data when high resolution data (say 10 samples/crank angle) and low resolution samples (1 sample/crank angle) are available. What are their relative advantages and disadvantages?
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. 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?
5. 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.

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

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

6. 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.
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. 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?
9. 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?