PAPER ID-310209

Subject Code: KAU051

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2023-24
AUTOMOBILE ENGINES & COMBUSTION

TIME: 3 HRS **M.MARKS: 100**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt*all* questions in brief. **2 x 10 = 20**

Qno.	Question	Marks	CO
a.	Explain the term Internal Combustion Engine.	2	1
b.	Discuss the term "Mechanical efficiency".	2	1
c.	Discuss the concept of 'Flame Propagation' & 'Flame Stability'.	2	2
d.	What do you understand by 'Adiabatic Flame Temperature'?	2	2
e.	Discuss the term lean and rich mixture.	2	3
f.	List the factors affecting combustion in CI engine.	2	3
g.	Explain Physical delay and Chemical delay in CI Engines.	2	4
h.	When does an engine need supercharging? How is it done?	2	4
i.	Discuss NOx Emission.	2	5
j.	What is the purpose of 'Catalytic Converter' in IC Engine?	2	5

SECTION B

2. Attempt any *three* of the following:

Qno.	Question	Marks	CO
a.	Derive an expression for the efficiency of Otto cycle and comment on the effect of compression ratio on the efficiency with respect of ratio of specific heats by means of a suitable graph.	10	1
b.	Explain in brief about flame temperature. Also Explain in detail about burning velocity of fuels.	10	2
c.	Bring out clearly the process of combustion in CI engines and also explain the various stages of combustion.	10	3
d.	Illustrate the operation of any two type of modern fuel injection system with sketch and also explain working of pintle nozzle and pintaux nozzle with sketches.	10	4
e.	Illustrate Particulate emissions & also give methods of controlling Emissions.	10	5

SECTION C

3. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	In an engine working on the ideal dual-combustion cycle, the temperature and pressure at the beginning of compression are 100°C and 1 bar respectively. The compression ratio is 13. If the maximum pressure is limited to 80 bar and 1,700 kJ of heat is supplied per kg of air, determine the temperatures at salient (key) points of the cycle and the ideal thermal efficiency of the engine. Assume $\gamma = 1.4$. $C_p = 1.01$ kJ/kg K and $C_V = 0.72$ kJ/kg K for air.	10	1

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b.	Briefly Explain i. Burning Time loss factor ii. Heat loss factor iii. Exhaust blow down factor iv. Pumping loss factor	10	1

4. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	One kg C8H18 fuel is supplied to an engine with 13 kg of air. Determine the percentage by volume of CO2 in dry exhaust gas considering exhaust gas to consist of CO2, CO and N2.	10	2
b.	Discuss Flue Gas analysis & also describe theoretical air required for complete combustion.	10	2

5. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	What are the various types of combustion chambers used an SI engine. Also explain the phenomenon of knock in SI engines.	10	3
b.	What are the two conventional types of ignition systems that are normally used in automobiles? Explain in detail.	10	3

6. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	A simple jet carburetor is required to supply 5 kg of air and 0.5 kg of fuel per minute. The fuel specific gravity is 0.75. The air is initially at 1 bar and 300 K. Calculate the throat diameter of the choke for a flow velocity of 100 m/s. Velocity coefficient is 0.8. If the pressure drop across the fuel metering orifice is 0.80 of that of the choke, calculate orifice diameter assuming, C_{df} = 0.60 and γ= 1.4.	10	4
b.	Derive an expression for the calculation of exact A-F ratio i. Neglecting compressibility, and ii. Taking compressibility into account.	10	4

7. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Compare wet sump and dry sump lubrication system. Also Explain in detail about 'Crankcase ventilation'.	10	5
b.	Discuss the alternative fuels for IC engines also discuss the rating for CI engine fuel.	10	5