MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

AUE-703A

COMBUSTION AND POLLUTION CONTROL IN AUTOMOBILE

Time Allotted: 3 Hours   Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. $10 \times 1 = 10$

(i) Blue smoke in diesel engine indicate

(A) NO_x (B) HC
(C) CO   (D) Unburnt oil

(ii) Photochemical smog is mainly due to

(A) NO_x and HC   (B) Soot and particulate matter
(C) CO and CO_2 (D) Excess O_2

(iii) Strictest Emission norms are initiated in the world first in

(A) London   (B) New Delhi
(C) Tokyo   (D) California

(iv) NOx emission is maximum in SI engines when the air-fuel ratio is

(A) nearly stoichiometric   (B) lean
(C) rich   (D) none of these

(v) One of the major Exhaust Emissions from CI engines compared to SI engine is

(A) Oxides of Nitrogen   (B) Unburnt hydrocarbons
(C) Particulates   (D) CO and CO_2

(vi) Decrease in air-fuel ratio in SI engines result in

(A) increase of NO_X
(B) decrease of CO and unburnt hydrocarbons
(C) increase of CO and unburnt hydrocarbons
(D) none of these

(vii) Chemiluminescence analyzer is used for measuring

(A) NO_X (B) HC
(C) CO_2 (D) CO

(viii) Evaporative emission in SI engine account for emission of

(A) 50% CO   (B) 50% HC
(C) 25% HC   (D) 100% HC

(ix) Platinum and Rhodium promote the oxidation of

(A) CO,HC   (B) CO
(C) CO and HC   (D) NO_X

(x) In SI engine flame speed increase

(A) with turbulence   (B) with fuel air ratio
(C) both (A) and (B)   (D) none of these

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. $3\times5 = 15$

2. Discuss the various causes of incomplete combustion in I.C. Engine.

3. What is evaporative loss? What are the sources of evaporative hydrocarbon?

4. Find the air required to burn the fuel (85% C, 15% H_2) for complete combustion, when O_2 is present 23% by weight in air.

5. Discuss the methods used before combustion to control the auto emission.

6. Describe the causes of Hydrocarbon Emissions from SI Engine.

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. $3\times15 = 45$

7. (a) An internal combustion engine is supplied with a mixture of octane vapour (C_8H_{18}) and air, under steady running conditions the dry exhaust gas analysis shows 13% CO_2. Assuming combustion to be complete.   10+5

(i) Determine the ratio by volume of fuel to air supplied.

(ii) Express this as a % of the chemically correct ratio.

(b) Discuss the major health effects of auto emission.

8. Describe the effect of Crevice volume, Valve overlap and Equivalence Ratio in Automotive pollution and also explain in detail how particulate emissions are caused.   9+6

9. Explain with a sketch the Non-exhaust emission from a vehicle and how   6+9

EGR reduces the Automotive pollution?

10. What is crankcase blowby? How it is controlled? Explain with a sketch of function of NDIR analyzer.   2+5+8

11. Explain a charcoal canister for controlling the emission and describe with a neat sketch the function of Flame Ionization Detector and Chemiluminescence Analyzer.   5+5+5