(b)

Constituents	% by volume	vol per each Kg	O_2 Reqd.
H_2	50	0.5	0.25 m^3
CH_4	30	0.3	0.6 m^3
N_2	2	—	
CO	7	0.07	0.035 m^3
C_2H_6	5	0.05	0.175 m^3
W.P.	3	—	

— (1M)

① $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

1 vol. 0.5 vol.

$\therefore$ 0.5 vol. $H_2 = 0.5 \times 0.5 = \underline{0.25}\ m^3$

② $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

1 vol. 2 vol.

0.3 vol of $CH_4 = 2 \times 0.3 = \underline{0.6}\ m^3$ ⟹ (2M)

③ $CO + \frac{1}{2}O_2 \rightarrow CO_2$

1 vol. 0.5 vol.

$0.07 \times 0.5 = \underline{0.035}\ m^3$

④ $C_2H_6 + 3.5O_2 \rightarrow 2CO_2 + 3H_2O$

1 vol 3.5 vol.

0.05 vol $= 0.05 \times 3.5 = \underline{0.175}\ m^3$.

$\therefore$ Vol. of O_2 reqd for complete combustion of $1m^3$ of gaseous fuel $= (0.25 + 0.6 + 0.035 + 0.175)$

$= \underline{1.06}\ m^3$ of O_2

① $\therefore$ Vol of air reqd for complete combustion of $1m^3$ fuel $= \frac{100}{21} \times 1.06$

$= \underline{5.048}\ m^3$

$\therefore$ Hence vol. of air for $2m^3$ of fuel. $= 5.048 \times 2$

$= \underline{10.095}\ m^3$ — (1M)

② Wt of Air for complete combustion $= \frac{10.095 \times 28.949}{22.4}$

$= \underline{13.04}$ Kg — (1M)

(c) Factors affecting Rate of corrosion :—

① Humidity in Air → 2M

② Influence of PH → 2M

③ Relative area of cathode/anode. → 2M

} 6M

END SEMESTER EXAMINATION.
SECOND HALF - 2021
BRANCH: FE (COMP/IT).

Q.1 a) Principle of EDTA Method :-
Equation → 1 M.
Explaination → 2 M. } 3 M.

b) Diff. between octane no & cetane no.
Any 3 or 4 points → 3 M.

c) Defn and Significance VI → 1 M
cloud pt. & pour pt → 1 M
Sapn Value → 1 M.

d) Reason Explanation → 3 M.

e) $GCV = \frac{1}{100}(8080C + 34500(H - \frac{O}{8}) + 2240S)$

$= \frac{1}{100}(8080 \times 80 + 34500(7 - \frac{3}{8}) + 2240 \times 3.5)$

$= \frac{1}{100}(666400 + 34500(7 - 0.375) + 2240 \times 3.5)$

$= \frac{1}{100}[$

$= \frac{1}{100}[882802.5]$ } 2 M.

GCV = 8828.025 kcal/kg
NCV = [GCV - 0.09 H x 587]
= 8828.025 − 0.09 × 7 × 587
= 8828.025 − 369.81
= 8458.215 kcal/kg. } 1 M

Q.2 a) Cathodic protection = Defn → 1 M.
Impressed current cathodic protection ⇒ Diagram - 1 M
Explaination - 2 M

3 (a) (a) % N. = $\frac{(Y-X) \times 1.4 \times N.}{W}$ = $\frac{12.7 \times 1.4 \times 0.5}{2.5}$

= 3.55 % ⇒ (2M)

% S = $\frac{32 \times x \times 100}{233.4 \times W}$ = $\frac{32 \times 0.28 \times 100}{233.4 \times 1.5}$ = $\frac{896}{350.1}$

= 2.56 % ⇒ (2M)

(b) STRESS CORROSION:-

Explaination ⇒ (2M)

Example ⇒ Season cracking } 3M } 5 M.

⇒ Caustic Embrittlement }

(c) Ion Exchange process.

principle ⇒ 1M

Diagram ⇒ 1 M.

Process ⇒ 2 M. } 6M.

2 Advantage ⇒ 1 M

2 Disadvantage ⇒ 1 M

(c) ~~Factors affecting Rate of corrosion:-~~

~~① Humidity in Air → 2M.~~

~~② Influence of PH → 2 M~~ } 6M.

~~③ Relative areas of cathod/Anode → 2M~~

4 (a) fluid film Lubrication:-

Explanation → 2M

Diagram → 1M } 4 M.

Example — 1 M.

b) 1) Strength of SHW

0.25 gm $CaCO_3$ ≡ 250 ml.

∴ 250 mg $CaCO_3$ ≡ 250 ml D/w.

∴ 1 ml SHW = $\frac{250}{250}$ mg $CaCO_3$ Eq.

1 ml of SHW ≡ 1 mg $CaCO_3$ Eq. ⇒ (1M)

2) 50 ml of SHW = 40 ml EDTA.

50 ml SHW ≡ 50 × 1 mg $CaCO_3$ Eq = 40 ml EDTA

∴ 1 ml EDTA = $\frac{50}{40}$ mg $CaCO_3$ Eq.

∴ 1 ml EDTA = 1.25 mg $CaCO_3$ Eq. ⇒ (1M)

3) Total Hardness

50 ml Hard water ≡ 10 ml EDTA

∴ Total Hardness in 1 lt = $\frac{10 \times 1.25 \times 1000}{50}$

= 250 mg $CaCO_3$ Eq.

⇒ (1M)

4) Permanent Hardness.

50 ml B/f water = 5 ml EDTA.

∴ Permanent Hardner in 1 lt = $\frac{5 \times 1.25 \times 1000}{50}$

= 125 ppm. ⇒ (1M)

5) Temporary Hardness = Total Hardness − perm. H.

= 250 − 125

= 125 ppm. ⇒ (1M)

c) · Origination of Paint → 1 M.

Function of constituents ⇒ 5 constituent = 5 M } 6 M.

1 M Each.