Registration No : | | | | | | | | | | |

Total number of pages : 03 **B.Tech.**
PCE4I104

4th Semester Regular / Back Examination 2017-18
FUEL & ENERGY TECHNOLOGY
BRANCH : CHEM
Time : 3 Hours
Max Marks : 100
Q.CODE : C890

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right-hand margin indicate marks.
Assume suitable notations and any missing data wherever necessary.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1. Answer the following questions : (2 x 10)

(a) The ultimate analysis of coal gives
- i. Carbon, hydrogen, and ash
- ii. Volatile matter, moisture, ash, and fixed carbon
- iii. Carbon, hydrogen, sulphur, and nitrogen
- iv. Volatile matter, moisture, nitrogen, and fixed carbon

(b) Which of the following coal has the highest calorific value?
- i. Peat
- ii. Lignite
- iii. Bituminous
- iv. Anthracite

(c) Control of incomplete combustion loss would mean
- i. Decreasing the amount of excess air
- ii. Increasing the amount of excess air
- iii. Increasing the fuel/air ratio
- iv. To decrease moisture loss

(d) The primary purpose of visbreaking process is
- i. To increase viscosity and pour point
- ii. To reduce viscosity and pour point
- iii. To increase viscosity and reduce pour point
- iv. To reduce viscosity and increase pour point

(e) The gaseous fuel that produces more heat than other fuel gases is
- i. Water gas
- ii. Producer gas
- iii. Carburetted water gas
- iv. Semi-water gas

(f) Which of the following hydrocarbons are the most desirable in kerosene?
- i. Paraffins
- ii. Isoparaffins
- iii. Naphthenes
- iv. Aromatics

(g) The monometallic catalyst used in the catalytic reforming of naphthas is
- i. Pt
- ii. Ni
- iii. Fe
- iv. V_2O_5

(h) Producer gas is a mixture of
- i. $CO + H_2$
- ii. $CH_4 + H_2$
- iii. $CO + N_2$
- iv. $CO + CH_4$

(i) Heavy water is used in nuclear reactors to
- i. Cool the reactor
- ii. Facilitate the release of neutrons
- iii. Control fission
- iv. Slow down the speed of neutrons

(j) Which of the following is not a fission fuel?
- i. U - 233
- ii. U - 235
- iii. Pu - 239
- iv. U - 238

Q2. **Answer the following questions :** **(2 x 10)**

(a) What are the objectives of coal washing?
(b) Mention petrographic constituents of coal.
(c) What is power alcohol?
(d) What are the advantages of catalytic cracking over thermal cracking?
(e) Write the various reactions involved in reforming process.
(f) Mention different types of coal tar fuels and uses of CTF.
(g) Write the composition and uses of natural gas.
(h) Mention the factors affecting composition of coke oven gas.
(i) In what way wind energy can be utilized?
(j) Write the properties of thorium.

Part – B (Answer any four questions)

Q3. **(a)** Write the characteristics of Bituminous and Anthracite coal. **(4)**
(b) Discuss the steps to be taken to prevent the loss of coal. **(3)**
(c) What is washability of coal? Explain briefly any coal cleaning process. **(8)**

Q4. **(a)** Discuss about the properties of coke. **(5)**
(b) Briefly discuss about the byproducts of coke ovens for the manufacture of metallurgical coke. **(10)**

Q5. **(a)** Describe in details about crude distillation system with neat flow diagram. **(10)**
(b) Explain Delayed coking process with a neat sketch. **(5)**

Q6. **(a)** Describe in detail, the Lurgi gasification process with a neat diagram of the gasifier. Also discuss in detail the process variables. **(10)**
(b) Give a brief description on Fisher-Tropsch process. **(5)**

Q7. Discuss the functions of different elements of a nuclear reactor. Write in brief about the fast breeder reactor. **(15)**

Q8. The analysis of the coal in boiler trail was C = 81%, H_2 = 4.5%, O_2 = 8%, and remainder is incombustible. The Orsat analysis of the dry flue gas was CO_2 = 8.3%, CO = 1.4%, O_2 = 10%, N_2 = 80.3 %. Determine: **(15)**

i. The weight of air supplied per kg of coal.
ii. The percentage of excess air.

Q9. **(a)** How geothermal energy is used to generate electricity. **(5)**

(b) What is water gas? Explain its manufacturing process by a diagram with the reactions involved. How it differs from the carburetted water gas? **(10)**