Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5667]-1004

F.E. (I Semester) EXAMINATION, 2019

ENGINEERING CHEMISTRY

(2019 PATTERN)

Time : 2½ Hours **Maximum Marks : 70**

N.B. **:—** (*i*) Solve either Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *Or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Classify the composites on the basis of reinforcement. Give any *three* properties and application of polymer composites. [7]

(*b*) (*i*) Define quantum dots. Give any *two* properties of quantum dots. [3]

(*ii*) What are nanomaterials ? Give any *two* important applications of nanomaterials with example. [3]

P.T.O.

(*c*) What is biodegradable polymer ? Explain the favourable conditions for biodegradation. Give any *two* applications of biodegradable polymer. [5]

Or

2. (*a*) What are carbon nanotubes ? Discuss the different types of carbon nanotubes with respect to their structure. Give any *three* applications of it. [7]

(*b*) Give the structure, properties and applications of : [6]

(*i*) Polycarbonate

(*ii*) Polyphenylene vinylene (PPV).

(*c*) Explain the structure of graphene with the help of diagram. Give any *three* applications of graphene. [5]

3. (*a*) (*i*) 0.5 gm of coal sample on complete combustion was found to increase the weight of $CaCl_2$ U-tube by 0.2 gm and KOH U-tube by 1.2 gm. Calculate % C and % H in the given coal sample. [4]

(*ii*) Write chemical reaction for production of Biodiesel and give its any *two* advantages. [3]

(*b*) Explain in brief the process with diagram for distillation of crude petroleum. Give composition, boiling range and uses of any *two* fractions obtained. [5]

(*c*) Explain the production of hydrogen by steam reforming of methane and coke with reaction conditions. [5]

Or

4. (*a*) (*i*) On burning 0.84 gm of solid fuel in a bomb-calorimeter, the temperature of 3000 gm of water increased from 26.8°C to 29.6°C. Water equivalent and latent heat of steam are 380 gm and 587 cal/gm respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific value. [4]

(*ii*) Define gross and net calorific value and justify the relationship between GCV and NCV of the fuel, if the fuel contains hydrogen. [3]

(*b*) What is power alcohol ? Give any *three* merits and demerits of power alcohol. [5]

(*c*) What is proximate analysis of coal ? Explain the procedure for determination of each constituent with its formula. [5]

5. (*a*) Give the principle, instrumentation and applications of UV-visible spectrophotometer. [7]

(*b*) What are the conditions of absorption of IR radiations by the molecule. Draw a block diagram of IR spectrophotometer. Explain any *three* components of IR spectrophotometer with their functions. [6]

(*c*) (*i*) State and give mathematical expression of Beers and Lambert's law. [3]

(*ii*) Define the following : [2]

(1) Chromophore

(2) Bathochromic shift.

Or

6. (*a*) Give principle of IR spectroscopy. Explain modes of vibrations with stretching and bending vibrations. [7]

(*b*) Explain different types of electronic transitions that occur in an organic molecule after absorbing UV-radiations. [6]

(*c*) Explain any *five* applications of IR spectroscopy. [5]

7. (*a*) (*i*) Define oxidation corrosion. Explain general mechanism of oxidative corrosion. [4]

(*ii*) What is galvanising ? Explain process with neat labelled diagram to protect iron from corrosion. [3]

(*b*) Explain any *five* factors affecting corrosion on the basis of nature of metal. [5]

(*c*) Define electroplating. Explain electroplating process with neat labelled diagram and applications. [5]

Or

8. (*a*) (*i*) What is principle of cathodic protection ? Explain it with any *one* suitable method. [4]

(*ii*) Distinguish between anodic and cathodic coatings. [3]

(*b*) What is Pilling-Bedworth ratio ? Give *four* types of oxide films formed on surface of metal with suitable example. [5]

(*c*) Define corrosion. State the condition under which wet corrosion occurs. Explain hydrogen evolution mechanism of wet corrosion. [5]