

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY
MARCH, 2014

APPLIED SCIENCE-I (Physics)
(Common except DCP and CAHM)

[Time : 1½ hours]

(Maximum marks : 50)

PART—A

(Maximum marks : 4)

- | | Marks |
|--|---------|
| I Answer the following questions in one or two sentences. Each question carries 2 marks. | |
| (a) Write down the dimensional formula for power. | 2 |
| (b) State Hooke's law. | 2 |
| | (2×2=4) |

PART—B

(Maximum marks : 16)

(Answer any two full questions. Each question carries 8 marks.)

- | | |
|---|----------|
| II (a) When a body is thrown up, show that the time of ascent is equal to the time of descent. | 4 |
| (b) Derive kinetic energy of a disc rolling on a horizontal surface. | 4 |
| III (a) Illustrate centripetal force in banking of curves. | 4 |
| (b) Derive an expression for orbital velocity of a satellite. | 4 |
| IV (a) What is impulse? Calculate the impulse required to stop a car of mass 2000 kg moving with speed of 30 m/s. | 4 |
| (b) State and explain parallel and perpendicular axes theorem. | 4 |
| | (2×8=16) |

PART—C

(Maximum marks : 30)

(Answer one full question from each unit. Each question carries 15 marks.)

UNIT—I

- | | |
|---|---|
| V (a) Coefficient of viscosity of water in SI is 10^{-3} . Find its value in CGS unit using dimensional analysis | 3 |
| (b) Obtain an expression for maximum range for a body projected with a velocity 'u'. What will be its maximum range when the velocity is doubled? | 6 |

- (c) A neutron having a mass of 1.67×10^{-27} kg and moving at 10^8 ms⁻¹ collides with a deuteron at rest and sticks to it. Calculate the speed of the combination. [mass of deuteron = 3.34×10^{-27} kg].

6

Or

- VI (a) Sand is thrown on tracks covered with snow in hilly areas. Why? 3
 (b) Prove the law of conservation of momentum from Newton's second and third laws. 6
 (c) A body moving with uniform acceleration describes 10 m in the 2nd second and 20 m in the fourth second of its motion. Calculate the distance moved by it in the fifth second. 6

UNIT—II

- VII (a) Explain the term 'elastic fatigue'. 3
 (b) What do you understand by geostationary satellites? Deduce the value of its height above the surface of the earth in kilometer. [Radius of earth = 6400 km; and 'g' of earth = 9.8 ms⁻²]. 6
 (c) A circular disc of mass 300 kg and diameter 4 m rotates with an angular velocity of 90 rpm. When a torque is applied, its velocity is reduced to 60 rpm in 30s. Find the value of the torque. 6

Or

- VIII (a) Distinguish between 'g' and 'G'. 3
 (b) Derive an expression for the moment of inertia of a uniform circular disc about an axis passing through its centre and perpendicular to its plane. 6
 (c) A steel wire of length 4.7 m and area of cross section 3×10^{-5} m² stretches by the same amount as a copper wire of length 3.5 m and area of cross section 4×10^{-5} m² under a given load. What is the ratio of Young's Modulus of steel to that of copper? 6

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/
TECHNOLOGY—MARCH, 2014

APPLIED SCIENCE-I (Chemistry)

(Common except DCP and CABM)

[Time : 1½ hours

(Maximum marks : 50)

PART—A

(Maximum marks : 4)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

(a) Define Normality.

(b) Give reason for the hardness of water.

(2×2=4)

PART—B

(Maximum marks : 16)

(Answer any two full questions. Each question carries 8 marks.)

II (a) The concentration of glucose ($C_6H_{12}O_6$) in normal blood is approximately 90 mg per 100 ml. What is the molarity of the glucose? 4

(b) What are radicals? Give two examples. 4

III (a) Explain redox reaction with an example. 4

(b) Draw a flow chart for the production of potable water for municipal supply. 4

IV (a) Explain the disadvantages of hardwater. 4

(b) What are the applications of carbon nanotubes? 4

(2×8=16)

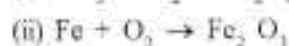
PART—C

(Maximum marks : 30)

(Answer one full question from each unit. Each question carries 15 marks.)

UNIT—I

V (a) Balance the following equations :



4

(b) Write down the molecular formula of following compounds :

(i) Calcium sulphate

(iii) Potassium carbonate

(ii) Ammonium phosphate

(iv) Magnesium nitrate

4

- (c) (i) Calculate the pH of an aqueous ammonia solution that has an OH^- concentration of $1.9 \times 10^{-3} \text{ M}$.
 (ii) Calculate the pH of a 0.025 M HNO_3 solution. 4
 (d) Explain neutralization reaction with an example. 3

Or

- VI (a) Classify the following as Lewis acid and Lewis base.
 H_2O , Al^{3+} , Cl^- , NH_3 , Fe^{2+} , OH^- , BF_3 , Na^+ . 4
 (b) Calculate the molecular weight of following compounds :
 (i) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ (iii) Fe_2O_3
 (ii) H_2SO_4 (iv) $\text{C}_2\text{H}_4\text{O}_2$ 4
 (c) A bottle of 12.0 N hydrochloric acid has only 35.7 ml left in it. What will the HCl concentration be if the solution is diluted to 250.0 ml ? 4
 (d) Define ionic product of water. Write its expression. 3

UNIT—II

- VII (a) List the properties of carbon nanotube. 4
 (b) What is sterilization of water? Mention the different methods of sterilization of water. 4
 (c) Explain chemical vapour deposition method for the synthesis of carbon nanotube. 3
 (d) Explain different types of filtration used in water treatment. 4

Or

- VIII (a) What are the characteristics of potable water? 4
 (b) Explain ion exchange method. 4
 (c) What are the applications of nanomaterials in medicine? 4
 (d) Explain High pressure carbon monoxide deposition method for the synthesis of carbon nanotube. 3