

B.Tech. All Branches 2007 Sem - I & II.

32832

SAPTICOSHI - I (2007 COURSE): WINTER - 2016
SUBJECT: ENGINEERING SCIENCE - I

Day: Monday
Date: 05-12-2016

Time: 10:00AM-TO1:00PM,
Max. Marks: 80

N.B.:

- 1) Q. No. 1 and Q. No. 5 are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer book.
- 4) Use of electronic pocket **CALCULATOR** is allowed.
- 5) Assume suitable data if necessary.

SECTION-I

Constants:

$$e = 1.6 \times 10^{-19} C$$

$$m_e = 9.1 \times 10^{-31} kg$$

$$h = 6.63 \times 10^{-34} J - s$$

$$m_p = 1.66 \times 10^{-27} kg$$

$$N_a = 6.025 \times 10^{23} \text{ atoms/gm-mole}$$

- Q.1 a) In Newton's rings, show that the radii of dark rings are proportional to the square root of natural number. (06)
- b) What do you understand by retardation plate? Derive the formula for thickness of quarter wave plate. (05)
- c) Differential between type I and type II superconductors. (03)
- Q.2 a) Explain the phenomenon of interference in thin film of uniform thickness and derive the formula for path difference in reflected system. (05)
- b) What is transmission grating? Derive the formula for intensity distribution when light is passed through grating. (05)
- c) A slit of width 0.16 mm is illuminated by light of wavelength 5600 \AA . Find the half angular width of the central maximum. (03)
- Q.3 a) Give the principle and construction of Nicol prism. How it can be used to produce plane polarized light. (05)
- b) Explain the operation of He-Ne gas laser with a neat labelled diagram. (05)
- c) X-ray having a wavelength of 0.15 \AA undergoes a Compton collision and is scattered at an angle of 37° . Calculate the energy of scattered photon. (03)
- Q.4 a) Explain how ultrasonic wave are used for: (06)
i) Flaw detection ii) Depth measurement
- b) Explain BCS theory to explain superconductivity. (04)
- c) A lecture hall of $15 \times 12 \times 5$ m dimension has an average absorption coefficient 0.10. Calculate the reverberation time. (03)

P. T. O.

SECTION-II

- Q.5 a) What are boiler troubles and what are their consequences? How can boiler trouble be minimized? (05)
- b) Explain the importance of ultimate analysis of coal. (05)
- c) Give the working of Lead- acid storage cell. (04)
- Q.6 a) What is the principle of Zeolite process? Write advantages, disadvantage and limitations of zeolite process. (05)
- b) An exhausted zeolite softner was regenerated by passing 150 litres of NaCl solution, having strength of 150 gm/l of NaCl. How many litres of hard water sample having hardness of 800 ppm can be softened using this softner? (04)
- c) Give the chemical reaction involved during heating of hard water. (04)
- Q.7 a) Define ionization and state the Arrhenius theory of electrolytic dissociation. (05)
- b) What are buffer solutions? Give preparation of acidic buffer. (04)
- c) Explain concept of pH and pOH. (04)
- Q.8 a) How the different factors are determined in proximate analysis of coal? (05)
- b) Explain composition, properties and applications of natural gas. (04)
- c) Give the merits and demerits of power alcohol. (04)

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32837

SAPTICOSHI - II (2007 COURSE) : WINTER - 2016
SUBJECT : ENGINEERING SCIENCE - II

Day : Tuesday
Date : 22-11-2016

Time : 10:00 AM - 01:00 PM
Max. Marks : 80

N.B.

- 1) Q.1 and Q.5 are COMPULSORY. Out of the remaining attempt any TWO questions from each Section.
- 2) Figures to the right indicate FULL marks.
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SECTION - I

Constants:

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$$m_p = 1.66 \times 10^{-27} \text{ kg}$$

$$N_a = 6.025 \times 10^{23} \text{ atom/gm-mole}$$

- Q.1 a) Explain the motion of charged particle in a parallel electric field. Derive (05)
formula for the impact velocity.
- b) Derive Schrödinger's time independent wave equation. (05)
- c) Calculate the conductivity of pure silicon at room temperature when the (04)
concentration of charge carrier is $1.6 \times 10^{10} / \text{cm}^3$.
Given : $\mu_e = 1500 \text{ cm}^2 / \text{volt-sec}$
 $\mu_h = 500 \text{ cm}^2 / \text{volt-sec}$
- Q.2 a) Explain the nuclear fission on the basis of liquid drop model of nucleus. (05)
- b) With schematic diagram, give principle and working of electron microscope. (05)
- c) Calculate the power output of a nuclear reactor which consumes 10 kg of U^{235} (03)
per day. Assume that the energy released per fission of U^{235} is 200 MeV.
- Q.3 a) State and explain de-Broglie's hypothesis. Give an experiment in support of (05)
it.
- b) Give physical significance of ψ and $|\psi|^2$. (05)
- ~~c) Calculate the first two permitted energy levels of an electron in an infinite (03)
potential well of width 1 \AA .~~
- Q.4 a) Classify the solids on the basis of band theory. (05)
- b) What is photovoltaic effect? Explain the working of solar cell with proper (05)
energy diagram.
- c) Define the term, Hall effect and Hall coefficient. (03)

P.T.O.

SECTION – II

- Q.5** a) Define corrosion of metals. Explain various factors affecting corrosion. [05]
- b) Give the formation of polyethylene by chain polymerization. [05]
- c) How will you distinguish following pairs from their IR Spectra? [04]
- i) Cis – stilbene and trans – stilbene.
- ii) Ortho – bromophenol and para – bromophenol.
-
- Q.6** a) “Thermoplastic resin get softened on heating where as thermosetting resins do not”. Explain. [05]
- b) Give the method of preparation, properties and applications of: [04]
- i) Polystyrene ii) HDPE.
- c) Give the classification of polymers on the basis of origin. [04]
-
- Q.7** a) Explain rusting of iron with suitable diagram and chemical reaction. [05]
- b) Write anodic protection methods for corrosion control. [04]
- c) Discuss the importance of design and material selection in controlling corrosion. [04]
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- Q.8** a) What is a spectrophotometer? What are its major components? Explain. [05]
- b) What is importance of ‘finger print region’ in IR Spectroscopy? [04]
- c) Give the principle of IR – Spectroscopy. [04]

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