Paper Code: ME-301	Roll No.									

B. Tech.
III-semester Examination 2015-16
Materials Science in Engineering

Time: 2 hours **Max. marks: 50**

Note: Question No.1 is objective-type single-answer type question. Answer the other questions as instructed. Marks are indicated therein. There is no negative-marking. Assume suitably any missing/inappropriate data/information, if any.

Q.1 Write answer of all the 10 objective questions: 1 x 10 = 10 marks

(i) Who said that for development of a nation what actually needed are: "blood & steel"
(A) Bismarck (B) Hitler (C) Churchill (D) Napoleon

(ii) Chemical symbol of Tungsten is
(B) W (B) Xe (C) Y (D) Zn

(iii) If voltage in the X-ray tube is 10 kV, approximately what is the min wavelength of X-ray, in angstrom
(A) 1.25 (B) 2.5 (C) 5.75 (D) 10

(iv) Radius of electron's second-orbit for Li++ is approximately (in angstrom) equal to
(B) 0.26 (B) 0.53 (C) 0.71 (D) 1.06

(v) Who discovered 'positron'
(A) Rutherford (B) Chadwick (C) Anderson (D) Yukawa

(vi) Angle between two planes having Miller Indices are (1 0 0) and (1 00) is
(A) 90º (B) 60º (C) 45º (D) 30º

(vii) Process of specimen's surface-hardening while retaining ductility of its core is called
(A) Strain-hardening (B) Quenching (C)Case-hardening (D) Age-hardening

(viii) Tungsten-carbide 'tips' for cutting-tools are made by the process
(A) Machining (B) Forging (C) Casting (D) Powder-metallurgy

(ix) For n-type extrinsic-semiconductor, the impurity addition in the intrinsic-semiconductor, could be of
(A) P (B) As (C) Sb (D) Any of these

(x) Galvanizing, for corrosion-prevention, is done by coating steel-component with
(A) Zn (B) Sn (C) Cr (D) Ni

Q.2 Write short notes on <u>any four</u> of the following 2 ½ x 4 = 10 marks

(a) Importance of Materials towards Technological & Socio-economic development
(b)Wave-Particle Duality & de-Broglie hypothesis
(b) Bohr's atomic model & formula for Hydrogen-spectra wavelengths
(c) Chemical-Bonds and properties due to it
(d) Atomic-radius to lattice-size relationship and APF for SC, BCC & FCC crystals
(e) Bragg's law and X-ray crystallography methods
(f) Griffith's theory of brittle-fracture

Q.3 Answer any two of the following 5 x 2 = 10 marks

(a) What do you understand by 'toughness' and describe the toughness- tests. Also explain ductile-brittle transition behaviour with respect to temperature and realization of its importance after the Titanic-ship disaster.

(b) Draw a neat labeled Fe-C equilibrium diagram and briefly describe cooling of mild-steel from molten-stage to solid-stage. Also, draw TTT-diagram and indicate (with lines) the relevant heat-treatment processes on it.

(c) Broadly classify various types of (i) Carbon-Steels and write its properties & applications. Also write % carbon , draw microstructure (indicating the constituent) and stress-strain curve for: (i) mild-steel & (ii) gray cast iron.

Q. 4 Answer any two of the following 5 x 2 = 10 marks

(a) Suggest suitable material(s) and its composition for the following
(i) Twist-**Dril**l (ii) Pepsi-**Can** (iii) Aircraft-**Body** (iv) Furnace-**Bricks** (v) Lathe-**Bed**

(b) Write typical composition and applications of the following
(i) Stainless-steel (ii) Muntz metal (iii) Gun metal (iv) White metal
(v) Solder-wire alloy

(c) Write full-form of
(i) HSS (tool-material) (ii) TCS (IT company) (iii) RCC (Building)
(iv) PVC (plastic) (v) BCS (superconductivity theory)

Q.5 Write short notes on any four of the following 2 ½ x 4 = 10 marks

(a) Hysteresis curve & loop and domain-theory explanation
(b) Magnetic storage & information-retrieving
(c) p-n junction as rectifier and transistor as amplifier
(d) High Tc superconductors and possible applications
(e) Ceramics & its applications
(f) Plastics and its future prospects
(g) Smart-materials and its applications

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