Total No. of Questions – [3] Total No. of Printed Pages: 4

G.R./PRN No.	

PAPER CODE	U123-209B(REG)

MAY 2023 (INSEM+ ENDSEM) EXAM

F.Y. B. TECH. (SEMESTER - II)

COURSE NAME: MATERIALS SCIENCE

COURSE CODE: ES10209B

(PATTERN 2020)

Time: [2Hr] [Max. Marks: 60]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data where ever required**

Question No.	Question Description	Marks	CO mapped	Blooms Taxonomy Level
Q.1	i) Match the following: 1 Tricalcium silicate — e 7 days for setting 2 Dicalcium silicate — f 28 days for setting 3 Tricalcium aluminate — g 1 day for setting a) 1-f,2-e,3-g b) 1-e,2-f,3-g c) 1-g,2-f,3-e d) 1-g, 2-e,3-f	[2]	1	U
	ii) The selection of an appropriate material and its subsequent conversion into a useful product with desired shape and properties follows which sequence? a) Material selection----- process selection -----production----- evaluation and possible redesign or modification b) Design---- material selection----- process selection -----production----- evaluation and possible redesign or modification c) Design----- process selection -----production----- evaluation and possible redesign or modification d)Design---- production----- evaluation and possible redesign or modification	[2]	1	U
	iii) Complete the following reaction: $C_4AF+7H_2O \rightarrow C_3A.6H_2O$ + ---------- +---------- a) $CF.H_2O$ + 880 kJ/kg b) $CF.H_2O$ + 420 kJ/kg c) $2CF.H_2O$ + 420 kJ/kg d) $CF.H_2O$ + 520 kJ/kg	[2]	1	A
	iv) General composition of fireclay bricks : Al_2O_3,SiO_2 and remaining part consists of oxides in the clay like K_2O, FeO, CaO, MgO, etc. The percentage of SiO_2 in this brick is..... a) 35% to 55% b) 65% to 85%	[2]	1	R

c) 40% to 55% d) 75% to 95%

v) Which of the following statements are correct? [2] 1 U
i) Dutch metal is an example of alloy
ii) Fibreglass is a ceramic material
iii) Fe_2O_4 is an example of magnetic ceramics
iv) Fe, Co, Ni are magnetic metals
a) Only i b) i and ii
c) i, iii and iv d) All above

vi) Heat treatable stainless steel is used in ---------- and magnetic non-heat treatable stainless steel is used in ---------- [2] 1 R
a) surgical instruments, automobile parts
b) automobile parts, surgical instruments
c) hammers, surgical instruments
d) dental instruments, dies for drawing wires

vii) Match the following : [2] 1 U

1	Shape-memory alloy	e	PZT
2	Piezoelectric Materials	f	NiTi
3	Magnetostrictive Materials	g	silicon carbide
4	Ceramics	h	Terfenol-D

a) 1-e,2-f,3-g,4-h b) 1-g, 2-h,3-e,4-f
c) 1-f, 2-h, 3-g,4-e d) 1-f,2-e,3-h,4-g

viii) Common MR fluid surfactants are: [2] 1 R
i)Oleic acid
ii)Tetramethylammonium hydroxide
iii)Citric acid
iv)Soy lecithin
a) i,ii,iii and iv b) i,iii and iv
c) i, ii and iii d) ii, iii and iv

ix) Calculate Molecular weight of Polyacetylene (Degree of polymerization – 1100) [2] 2 A
a) 27500
b) 30800
c) 29700
d) 28600

x) Match the following [2] 2 U

1	Bifunctional monomers	e	Sorbitol
2	Trifunctional monomers:	f	Glycerol
3	Tetrafunctional monomers:	g	Acrylonitrile
		h	Hexamethylene diamin

a) 1-e, 2-f, 3-g, 2-h
b) 1-g, 2-f, 3-e, 3-h
c) 1-g, 2-e, 3-f, 2-h
d) 1-g, 2-f, 3-e, 1-h

xi) Which of the following statements are not correct? [2] 2 U
i) A polymer shows appreciable conductivity if, the polymer chain shows isolated double bonds throughout its chain
ii) Intrinsically conducting polymer possesses low conductivity. Their conductivity can be improved by doping.

	iii) Presence of heteroatomic system enhances conductivity of polymer iv) Presence of saturated cyclic rings in the chain with continuous resonance enhances conductivity. a) i & ii b) iii & iv c) ii & iv d) i, & iv				
	xii) Match the following			[2]	2	U
	1	Smectic	e	sensitive to the environment			
	2	Nematic	f	parallel and lateral arrangement			
	3	Cholesteric	g	only parallel arrangement			
	4	Pitch	h	modified nematic			
	a) 1-e, 2-f, 3-g, 4-h b) 1-g, 2-f, 3-e, 4-h c) 1-f, 2-g, 3-h, 4-e d) 1-g, 2-f, 3-e, 4-h				
	xiii) _____ are used for air-craft structures. a) Electroluminescent polymers b) Fiber reinforced polymer composites c) Liquid Crystal Polymers d) Conducting Polymers			[2]	2	U
	xiv) Match the following			[2]	2	U
		construction industry	e	Polycarbonate			
		electronic industry	f	Acrylonitrile/butadiene/sty			
		Mechanical industry	g	Poly Methyl Methacrylat			
			h	Polystyrene			
			i	PVC			
	a) 1- h & i, 2-g & h, 3-e & f b) 1- h & i, 2- e & f, 3- g & h c) 1- e & f, 2- g & h, 3- h & i d) 1- g & h, 2- h & i, 3-e & f				
	xv) Which of the following statements are applicable for Thermoplastic Polymers? i) These polymers are soft, weak and less brittle. ii) These can be moulded and remoulded several times. iii) Epoxy based thermoplastic polymers are used as adhesives iv) They are formed by addition polymerization hence insoluble in organic solvents. a) i & ii b) only I c) i, ii & iii d) i, ii, iii & iv			[2]	2	U
Q2	**Solve any three out of four** a) Identify types of oxide films formed on the surface of the following metals and write their oxidation reactions. (i) Sodium (ii) Zinc (iii) Platinum (iv) Molybdenum (v) Nickel.			[5]	3	U & A
	b) 1) Predict the reactions of oxygen absorption mechanism for following conditions. Anode: Steel Plate, Cathode: Oxide Layer and Electrolyte: Moisture. (Write anodic, cathodic and net reactions) 2) Predict the reactions of following coating metals during electroplating. (i) Chromium (ii) Silver (write reactions at anode and cathode)			[5]	3	U & A
	c) Predict the rate and extent of corrosion depending on the following factors. i) Purity of metal ii) Physical state of metal iii) Temperature iv) Moisture v) pH			[5]	3	U & A

	d) Predict the most appropriate and economical corrosion protection method for following examples. i) Buried steel pipelines, Buried cables, Ship hull ii) Open water box coolers, Water tanks, Buried water or gas pipeline iii) containers used for storing foods, ghee, oils, pickles, medicines etc. iv) For getting decorative and protective surface against corrosion v) Hydraulic compressors, pressure vessels, pumps, Shock absorbers etc.	[5]	3	U & A
Q.3	**Solve any three out of four**			
	a) What are the possible electronic transitions involved in the following molecules when they are exposed to UV-Visible radiations? i) Naphthalene ii) Ethane iii) Ethanol iv) Acetaldehyde v) Pyridine	[5]	4	U & A
	b) Calculate number of fundamental modes of vibrations in the following molecules i) Carbon dioxide ii) Hydrochloric acid iii) Ammonia iv) Methanol v) Cyclohexane	[5]	4	U & A
	c) Determine the Miller Indices of simple cubic unit cell plane with intercepts (1, 1, 1), (∞, 1/2, ∞) with the help of figures.	[5]	4	U & A
	d) i) Acetamide absorbs at 1660 cm-1 whereas benzaldehyde absorbs at 1745 cm^{-1} ii) Differentiate between Scanning Electron Microscopy and Transmission electron microscopy.(Any three points)	[5]	4	R & U

Blooms Taxonomy Levels Abbreviations:

R: Remembering
U: Understanding
A: Applying
R & U: Remembering & Understanding
U & A: Understanding & Applying