Form A: *Ref. No.*Ex/Prod/T/222/2017 (Old)

B.E. PRODUCTION ENGINEERING SECOND YEAR EXAM 2017 (Old)

(2nd Semester)

SUBJECT: MATERIAL SCIENCE AND TECHNOLOGY

Time : Three hours **Full Marks : 100**

No. of questions		Marks

ANSWER QUESTION NO. 1 AND ANY FOUR QUESTIONS FROM THE REST

(Answer briefly. Irrelevant discussion will be penalised. Draw the sketches neatly and label them properly)

1. a)	Draw the iron-carbon equilibrium diagram and properly label the phase name, temperature, percentage of carbon, eutectic, eutectoid, peritectic point, hyper and hypo eutectic and eutectoid zone, commercial cast ion and mild steel range etc.	13
b)	Explain Avrami equation.	2
c)	Draw and label the T-T-T diagram for carbon steel with 0.8% carbon form kinetic curve.	5
2. a)	Draw a $(2\ \bar{8}\ 4)$ plain in a tetragonal lattice.	3
b)	The interplaner spacing between $(\bar{2}01)$ planes in a lithium crystal is 0.68Å. Determine the lattice parameter and the atomic diameter.	4
c)	Explain Van Der Waals bonding and Metallic bonding.	2+2
d)	Explain linear imperfections and surface imperfections in solids.	9
3. a)	Explain proof stress, proportional limit, yield strength, ultimate tensile strength and fracture point with the help of stress-strain diagram.	7
b)	Describe strain hardening phenomenon.	4
c)	Briefly describe recovery, recrystallisation and grain growth phenomenon.	9
4. a)	Describe homogeneous nucleation and deduce the critical radius for this type of nucleation.	6

P.T.O.

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No. of questions		Marks
b)	Compare Planar Growth and Dendritic Growth during solidification of materials.	4
c)	Explain the mechanism of ingot structure formation during solidification with suitable sketches	6
d)	What are the characteristics of a phase and also state the phase rule.	4
5. a)	What is eutectic point? Explain with the help of ice-sodium cloride phase equilibrium diagram. Differentiate between peritectic and eutectoid point.	3+3
b)	Differentiate between spheroidite structure and martensite structure. Also draw the respective micro-structures.	5
c)	Write short notes on Full Annealing, Martempering and Carburising.	3×3
6. a)	Write short notes on Wrought Iron and its commercial production methods.	3 + 5
b)	Describe the following NDT Methods along with their merits and demerits: (i) Magnetic method; (ii) Ultra sonic testing	4+4
d)	Explain L-D process for steel manufacturing.	4
7. a)	**Write short notes on:** (i) Bright Steel; (ii) Heat resistant steel; (iii) Phosphor Bronze; (iv) Piezo-electric Ceramics;	3 × 4
b)	What is Cermets and explain it briefly.	4
c)	Describe what are the additives required to synthesis the polymers for achieving desired properties.	4