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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B.Tech Mechatronics | **Semester – IV**
Subject (Course): Materials technology | **Max. Marks : 100**
Course Code : GNEG 286 | **Duration : 3 Hrs**
No. of page/s:2

S. No.		Marks	CO
	SECTION A		
Q 1	"Hardening of steel is always followed by tempering".is it true or false? If true, give reasons.	**4**	**CO4**
Q 2	Write the classification of engineering materials.	**4**	**CO5**
Q 3	Describe the Frenkel defect and Schottky defect in an ionic crystal.	**4**	**CO1**
Q 4	Differentiate b/w charpy and Izod impact test.	**4**	**CO2**
Q 5	Differentiate b/w case carburizing and nitriding.	**4**	**CO4**
	SECTION B		
Q 6	Define steel and differentiate b/w eutectoid, hypoeutectoid and hypereutectoid steel with help of diagram.	**4+6**	**CO3**
Q 7	Differentiate b/w Normalizing and Annealing along with the induced properties and microstructure.	**10**	**CO4**
Q 8	Calculate the planar atomic density in atoms per sq mm for following crystal planes in FCC gold,(lattice constant=0.40788 nm) a.(100) b.(110) c. (111) **or** A sample of BCC metal was placed in an x-ray diffractometer using x-rays with a wavelength of λ=0.1541 nm. Diffraction from (221) planes was obtained at 2θ=88.838˚.calculate a value for lattice constant 'a' for this BCC elemental metal (assume first order diffraction, n=1).	**10** **10**	**CO1**

Q 9	A steel specimen tested in standard tension test to evaluate mechanical properties. the data is given below. i) Diameter of specimen =12.5 mm ii) Original gauge length=62.5 mm iii) Load at lower yield point=41 kN iv) Load at upper yield point=42.5 kN v) Maximum load=72.5 kN vi) Gauge length after fracture=80.5 mm vii) Diameter after fracture=9.5 mm viii) Strain at load 20 kN = 7.764 x10^{-4} Calculate the following a) UTS c) % elongation b) Modulus of elasticity d) Modulus of resilience	**10**	**CO2**
	SECTION-C		
Q 10	Draw Fe-C equilibrium diagram and label the temperatures, composition and phases. Describe how the microstructure changes on cooling austenite at eutectoid composition. **Or** Draw phase diagram for Copper (Cu)-Nickel (Ni) system based on data provided below: Melting points: Cu = 1085°C , Ni= 1455°C Complete solid solubility of Cu in Ni. At 1200°C, liquid phase contains 30% Ni and solid phase contains 80% Ni. ii) If overall composition of system is 50% Ni and 50% Cu, calculate the relative amounts of solid and liquid at 1200 °C. Show the room temperature microstructure of this polycrystalline material. iii) Using Gibb's phase rule, find the degrees of freedom for pure Cu at 500°C.	**20**	**CO3**
Q 11	Define the following terms i) Polymers ii) Refractories iii) Stainless steels iv) Composites. v) Grey cast iron.	**5x4**	**CO5**