
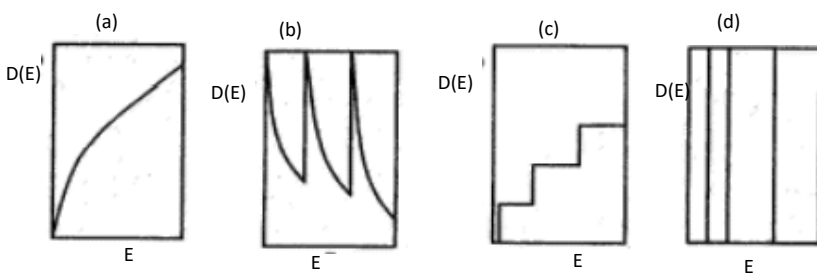
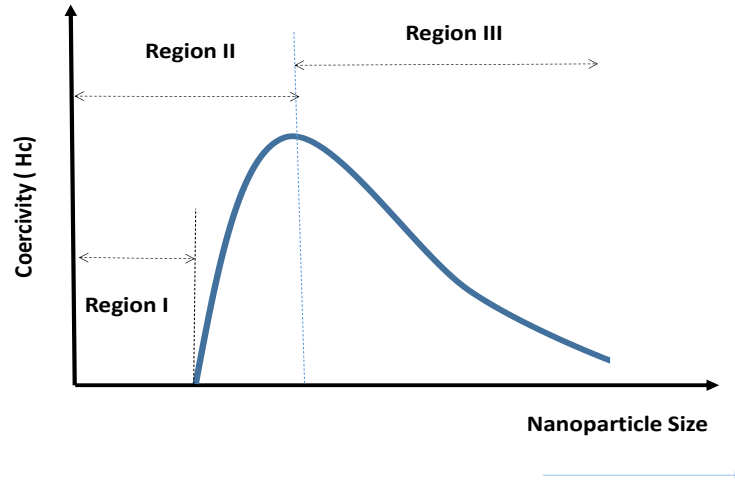


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
Course: MSc Physics Program: Magnetic Nanostructures: Fabrication& Characterization Course Code: PHYS8031P		Semester: III Time: 03 hrs. Max. Marks: 100	
Instructions: Read all the below mentioned instructions carefully and follow them strictly: Mention Roll No. at the top of the question paper. ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	Write any four Bottom up approaches in Nanotechnology?	4	CO1
Q2	There are two Photolithographic systems, one with the light source of wavelength $\lambda_1=156$ nm (system1), another with light source of wavelength $\lambda_2=325$ nm (system2). Both lithography systems are otherwise identical. If the minimum feature sizes that can be realized using system1 and system2 are L_{min1} and L_{min2} respectively, then find out the ratio of L_{min1}/L_{min2} .	4	CO2
Q3	Which of the following statements are correct in case of a magnetic material- (a) Hysteresis loss of hard magnetic materials will be less than that of Soft magnetic materials (b) Coercivity of Hard magnetic materials will be greater than that of Soft magnetic materials (c) Retentivity of Soft and Hard magnetic materials will always be equal (d) In a ferromagnetic system magnetization process occurs by two processes- either by movement of domain wall or by rotation of domain walls	4	CO2
Q4	How does domain wall thickness relate to the magnetic anisotropy constant and exchange integral?	4	CO2

Q5	<p>Density of states corresponding to quantum well, quantum dots, nanowires and bulk states are given in diagram below. (D (E) - Density of States, E-Energy). By observing the nature of D(E) Vs E, write down the name of nanostructure against (a), (b), (c) and (d)</p> 	4	CO1
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SECTION B
(4Qx10M= 40 Marks)

Q6	<p>See the graph below showing the variation of Coercivity with increasing nanoparticle size. One can see three regions marked as Region I, Region II and Region III. Explain in detail about the variation of Coercivity with particle size at each region and mention their importance.</p> 	10	CO2
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Q7	<p>What are Synchrotron radiations? Mention its characteristic features? How synchrotron radiation can be produced?</p>	10	CO3
Q8	<p>Why gold nanoparticles with different dimensions are showing different colours? Explain the phenomena 'blue shift' observed in nanoparticles .</p>	10	CO1
Q9	<p>What is nanosphere lithography? Explain various process involved in nanosphere lithography with suitable diagrams. OR Write any one self-organization method to prepare well-ordered Magnetic nanopatterns? Mention different stages of preparation?</p>	10	CO2

SECTION-C
(2Qx20M=40 Marks)

Q 10	Describe in detail about Photolithography and Electron beam lithography? Mention various stages of lithography process involved with appropriate diagrams and mention difference between these two approaches?	20	CO2
Q11	(a) Write the basic principle of Magneto-optical Kerr effect? Explain in detail about various components of MOKE set up. With the help of appropriate diagram, explain different measurement geometries of MOKE? <p style="text-align: center;">Or</p> (b) Describe in detail about any two Synchrotron based characterization tools to study Magnetism. (Working Principle, Geometry, Suitable Diagrams, experimental components, Output information and Advantages should be mentioned in detail)	20	CO3