Ref No. : Ex/PG/Nano/T/1210A/2018

Master of Technology in Nanoscience & Technology

1st year, '2nd Semester, Examination 2018

Nanocomposites **Full marks - 100**

Answer any five questions Marks

1.	(a)	What are the different classes of ceramic nanocomposites?	3
	(b)	What is the basic principle of synthesis of nanocomposites by mechanical alloying? Explain why it is possible to get chemical reactions at lower temperature and at a faster rate in this process.	5 + 5
	(c)	What are the disadvantages of ex-situ synthesis of metal matrix nanocomposites? 'How does the in situ approach of synthesis of MMNC help to overcome these problems?	3 + 4
2.	(a)	What are the essential properties of hard coating?	2
		Explain why extremely high hardness can be achieved in both multilayer and isotropic nanocomposites coating compared to single phase coating.	6 + 6
	(b)	Highlight the steps for deposition of nanocomposite coating by thermal spray method.	6
3.	(a)	Modification of nanoscale fillers are imporatnt before processing of polymer nanocomposites - Explain for all types of nanoscale fillers.	6
	(b)	Discuss how clay can be modified before the processing of clay / polymer nanocomposites. Discuss the different routes of processing of clay / polymer nanocomposites	4 + 4
	(c)	Using X-ray diffraction, how can you characterize modified clay, intercalated clay and exfoliated clay-polymer nanocomposites?	6
4.	(a)	Discuss how does the addition of nanofillers to polymer help to improve the following properties of the nanocomposite materials (consider all types of fillers)	
		i) Modulous and load carrying capacity	4 + 4 + 4
		ii) Toughness	5
		iii) Permeability	3
5.	(a)	What are the different types of coating applied on the nanoparticles for modification? What are the advantages of multilayer coating on nanoparticles? How this type of coatings are deposited on the nanoparticles?	2 + 3 + 2
	(b)	Highlight the different routes of processing of nanoparticle polymer nanocomposites.	13
6.	(a)	What is fractal geometry? Why is it important in the study of nanomaterials?	5
		What are the basic steps in the formation of a shape in fractal geometry?	5
		How do fractal geometry differ from classical geometry?	5
	(b)	Write a short note on encapsulated composite nanosystem.	5
7.	(a)	Discuss how equiaxed nano particles are made compatible with polymer matrix by small molecular attachment.	10
	(b)	Describe briefly the the processing methods of nanotube / polymer nanocomposites	10