BEL 721 Bionanotechnology
II[nd] Semester 2008-2009
Major Test

Max. Marks: 40
Max. Time 2 hrs

1	It has been proposed that an advantage of nanomechanical components is reduction of friction and wear compared to conventional engineering. Find an expression for the drag power (w) for a nanoscale bearing of radius r, length l, with a bearing stiffness k and a bearing surface velocity v. [4]
2.	Catenanes are an example of a nanosystem built by self assembly. What bonds are there between separate links of a catenane? When was the first [2]-catenane constructed? What are the dimensions of the smallest [2]-catenane constructed to date? [6]
3 A	What is patch clamp technique? What are different ways in which this technique has been used? [2+2]
3 B	What is the basic principle of molecular imprinting? Give one example each for the application of this technique in chiral separation of molecules and as enzyme mimics. [2+2]
4A	What is the recent approach used to synthesize and fabricate magnetic nanoparticles of high density data storage? Give steps of such synthetic process. [4]
4 B	Write the design principle for interfacing carbon nanotubes with simple protein systems with redox centres close to protein surface. What modifications are required in case redox centre is embedded deep within the protein? [2+2]
4C	What are the challenges in technical application of bacteriorhodopsin? What is artificial retina? How can you develop such a device using bacteriorhodopsin? Write the principle of read out in 3-D memories using bacteriorhodopsin? [1+1+2]
5A	Why the idea of inventing nanomachines by designing new proteins runs into severe obstacles? How can one overcome these obstacles? How will you design molecular actuators based on programmable shapes? [1+1+2]
5B	Give step wise method for the synthesis of bis-peptides. How can one develop predictable shapes using bis-amino acids? [2]
5C	What is the basic principle used in designing viral nanoelectronics? Give steps involved in developing viral battery. [4]