I SEMESTER M.TECH. (INDUSTRIAL BIOTECHNOLOGY) END SEMESTER EXAMINATIONS, NOV 2016

SUBJECT: MOLECULAR BIOLOGY AND rDNA TECHNOLOGY

[BIO5122]

REVISED CREDIT SYSTEM (26/11/2016)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitable assumed.

1A.	Explain why, RNA, and not DNA, is hydrolyzed under basic pH conditions.			2	
1B.	Consider the following polynucleotide chain:				
	AUUACGUGGUGCACUCGGGAACAUCCCGAGUGCACCACGUAAUGGA				2
	Draw the two most stable intramolecular secondary structures this polymer can adopt				
	The following observations were made during DNA replication in a microorganism, - a				
	RNA polymerase activity, - a DNA polymerase which functions only on single-stranded, -				
1C.	new enzyme which can generate a product sensitive to DNAse in the presence of				4
	NADH and a product insensitive to DNase and resistant to heat. With the given				
	information, deduce the DNA replication mechanism.				
1D.	Discuss Rho independent transcription termination in prokaryotes.			2	
2A.	Discuss the molecular cascade of Post-transcriptional modifications in mRNA.			3	
2B.	How do the roles of ATP and GTP differ in translation?			4	
2C.	How the different base pairs in DNA can be recognized from their edges without the				3
	need to open the double helix.				
3A.	Explain tautomeric shift, transition and transversion of DNA mutation.			3	
3B.	Discuss non-homologous end joining DNA repair mechanism.			2	
	How would you express the functional human insulin gene in a bacterial host?				
3C.	Note: The hormone insulin is a polypeptide made up of chain A and B. During				
	translation a single chain is produced and then undergoes a peptidolytic cleavage (post				
	translational modification) to yield chain A & B, and form a mature and functional				
	hormone.				
	Plasmid needs to be used for including heterologous DNA into a prokaryotic host, where it can				
	be cloned. From the following contents listed in each column, identify the best characteristic				
3D.	necessary for the above-said purpose. Justify your choice.				
	Plasmid Type	Origin of replication	Restriction sites		2
	Stringent	Present	EcoRI only		
	Relaxed	Absent	Pst III only		
	Col	NA	Both EcoRI and Pst III		
	Ti		Bam HI		
	The plasmid vector, Gene A and their restriction sites are given below. Construct a				
	recombinant DNA (plasmid + Gene A) using the right set of restriction enzymes. List the				

	combination of enzymes.				
	Yae I Kpn I Eae R I 5' CATATG 5' GTCGAC 5' GAATTC 3' GTATAC 3' CAGCTG 5' GAATTC BamH I Sal I Sma I 5' GGATCC 5' GGTACC 5' CTCGAG 3' CCTAGG 5' CTCGAG 3' GAGCTC 3' CCTAGG 5' CTCGAG 3' GAGCTC 3' CCTAGG 3' CCATGG 5' CTCGAG 3' CCTAGG 3' GAGCTC 4mp r Bam HI Bam HI Bam HI	2			
4A.	Sal I Sal I BamH I BamH I Gene A (1kb)				
4B.	Explain stringency of hybridization reaction.				
4C.	A 8.9 kb circular plasmid is digested with three restriction enzymes, EcoRI, BamHI and HindIII, Work out the restriction map of the plasmid. AGE DNA band sizes:- EcoRI- 8.9kb, BamHI-6kb+2.9kb, HindIII-8.9kb, EcoRI+BamHI-6kb+2.4kb+0.5kb,EcoRI+HindIII- 7.4kb+1.5kb,BamHI+HindIII-5kb+2.9kb+1kb,EcoRI+BamHI+HindIII-5kb+ 2.4kb+ 1kb+ 0.5kb.				
4D.	Diagrammatically, using lines as DNA and filled in boxes as primers, draw the products of the reaction starting from the double stranded piece of DNA below after it has gone through each of 2 rounds of replication. The binding sites of the primers are shown on the template below. Strand1 Primer1 Primer2				
	State the enzymes and reagents involved in sanger DNA sequencing and tell how the				
5A.	sequence information is obtained ?.				
5B.	Results from a single locus VNTR probe DNA fingerprint analysis for a female and her five children are given below. Identify the lane contains the DNA of the mother? Explain. AGE DNA fragment size: Lane 1 - 2kb, 3kb Lane 2 -2kb, 5kb Lane 3 -1kb, 4kb Lane 4 -2kb, 4kb Lane 5 -4kb Lane 6 -2kb, 5kb.				
5C.	Explain, how plant tissue culture technique is made use of, in raising transgenic plants?	5			