Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech-PHMB/SEM-2/PHMB-203/2012

2012
GENOMICS & PROTEOMICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

Answer Question No. 1 and any *three* of the rest.

1. Choose the correct answers for *five* of the following : $5 \times 1 = 5$

a) Microarray can commonly be used to detect

i) DNA Copy number variations and Microsatellite variations

ii) Single nucleotide variation (SNP/mutation) and quantitative expression of genes

iii) Relative expression of genes and copy number variation.

iv) Translocation of genes and expression of genes.

b) Polymerase chain reaction can be used to detect

i) Minisatellite markers and Single base substitutions only

ii) Translocation of a gene and quantitative change in gene expression only

iii) Microsatellite markers and Single base substitutions only

iv) All of these.

c) DNA-Transcription factor interaction can be studied by

i) RNA sequencing, PCR and DNA sequencing

ii) Protein sequencing and DNA sequencing

iii) DNA sequencing and PCR

iv) PCR only.

d) A set of gene has been observed to express in the same tissue at same level in many experiments using micro array. The most possible explanation of this observation is

i) the genes may be regulated by same transcription factors

ii) they together may carry out the same biological functions

iii) they are regulated by same regulators (Transcription factors/micro RNA) and perform together same functions

iv) the genes are conserved through evolution.

e) Among the following vectors, which one was very useful for human genome sequencing

i) Plasmid

ii) Cosmid

iii) Mammalian artificial chromosome

iv) Yeast artificial chromosome and bacterial artificial chromosome.

2. What are the different markers in human genome commonly used to identify the gene causing the Mendelian genetic disease ? Describe in brief the principles of the methods for identifying the gene causing the Mendelian Genetic disease.

3 + 7

3. Describe the basic principles of DNA sequencing. What is shot gun sequencing ? What are the differences between the methods of sequencing the genome using "clone by clone" sequencing and shot gun sequencing ? 2 + 3 + 5

4. Describe the basic principles of making the microarray. What are the information we get by microarray analysis for gene expression ? 6 + 4

5. Write short notes on any *two* of the following : 2 × 5

a) Functional Cloning of the gene that causes Mendelian Genetic disease

b) Uses of Expressed Sequence Tag (EST)

c) Uses of SNPs.

GROUP - B

6. Answer the following : $5 \times 1 = 5$

   a) What is the first dimension called in 2D gel electrophoresis ?

   b) Name one database of 2D gel electrophoresis.

   c) What is the advanced mass spectrometer called ?

   d) What is last step in a microarray technology ?

   e) Name a common matrix used in MALDI TOF.

7. Answer any *two* of the following : $2 \times 5 = 10$

   a) Explain in brief the first dimension and second dimension analysis of 2D gel electrophoresis. Also mention its advantages over one dimensional electrophoresis. 4 + 1

   b) What is the need of microarrays ? Is protein array design easier than DNA array ? Justify. 3 + 2

   c) Explain excision and in-gel digestion in gel electrophoresis. 5

8. Answer any *two* of the following : $2 \times 10 = 20$

   a) How is a reflectron TOF-mass spectrometer improved than linear TOF-mass spectrometer ? Explain with a neat diagram. 7 + 3

   b) Describe the various steps involved in comparing gene expression in a diseased and normal tissue of the same type using microarray technology. 10

   c) Mention various classes of capture molecules for protein arrays and discuss their importance with example. 5 + 5