JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- 2023
MSc-II Semester (Biotechnology)

COURSE CODE(CREDITS): 20MS1BT211(3) MAX. MARKS: 35
COURSE NAME: Genetic Engineering
COURSE INSTRUCTORS: Dr Anil Kant MAX. TIME: 2 Hours

Note: (a) *All questions are compulsory.*
(b)Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.1

a. Appraise the concept of gene libraries. Outline the procedure to construct genomic libraries? Why is partial digestion often used for constructing genomic libraries? [3]

b. Enlist the screening method that can be used for expression libraries. Describe in detail the screening methods based on functional complementation considering a suitable classical example? Include the concept of mutant test organism in your description. [3]

c. What factors dictate the minimum number of clones in a gene library? Calculate the minimum number of clones required in a human gene library? Given: genome size 3.2 x 10^6 KB, average size of fragments cloned 700 KB and 99 % probability of finding a random clone. [4]

Q.2

a. Discuss different functional modules of Ti plasmid of *A. tumefaciens*, construction and working binary vector system designed for plant gene transfer. [3]

b. What is the basis of using baculovirus, *Autographa californica* for development of an expression platform. Briefly discuss its life cycle and general design of the vectors developed and advantages offered by Baculovirus based vectors for expression of recombinant proteins. [3]

Q.3

a. Why is it advisable to produce recombinant protein in two phases i.e growth and production? [1.5]

b. Figure out three most important differences between pET 3 and pET 11 and their consequences. [1.5]

c. Expression vectors have been developed to produce recombinant proteins with different types of tags. Draw a well labeled diagram of such an expression vector. Identify the role of and give examples of i) Purification tags ii) Assay Tags. [1.5]

Q.4

a. What is the melting temperature of PCR primers? How is it related to annealing temperature? Calculate melting temperature of a primer with the following sequence? CTGCCCGACGTCCGGTCGTACCGGT [3.0]

b. Write about given variations of PCR. Include technological variation and most important application in your answer i) Real Time PCR ii) Touchdown PCR [2.5]

Q.5 Do any three of following questions [3x3 = 9]

a. Assign role of following proteins highlighting their main activity, in mechanism of RNA interference i) DICER ii) HASTY iii) DROSHA iii) RISC iv) DICER like protein v) HcPro and P19

b. How blue colored rose variety could be developed. Include the function of genes, their sources, and reasons which were downregulated and overexpressed to develop blue colored roses.

c. What is the significance of gene knockdown in research and development? Write about traditional gene knockout and CRISPR cas based methods.

d. What is the nature of the following component in the mechanism of CRISPR-cas based gene knockout / editing i) CRISPR gene. ii) Cr RNA iii) transactivating cr RNA iv) Case protein iv) ribonuclease III

e. Discuss design of vectors developed for delivering CRISPR components to the target cells. Draw a suitable diagram. Give one example of development of modified organisms with help of CRISPR cas editing.