

**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT**  
**TEST -3 EXAMINATIONS- 2026**  
**M.Sc-II Semester (BT)**

**COURSE CODE (CREDITS):20MS1BT211(3)**

**MAX MARKS: 35**

**COURSE NAME: Genetic Engineering**

**COURSE INSTRUCTOR:Dr. Anil Kant**

**MAX. TIME: 2 Hours**

*Note: (a) All questions are compulsory. (b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems (c) Use of calculator is allowed*

| Q.No | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Marks   |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Q1   | a. Which modification resulted in computerized base calling is Sanger sequencing?<br>b. Mention any three types of genes have been transferred to develop GM crops with purpose?<br>c. Present two quick points how GM crops can pose a risk to humans and measures taken to mitigate such risks?<br>d. Briefly explain three ideal characteristics of cloning vectors?<br>e. Enlist physical gene transfer methods and explain the principle of particle bombardment method.<br>f. What are the precise roles of i) SUP4 ii) URA 3 iii) ori and ARS in yeast artificial chromosomes.                                                                                                                                                                                                                                                           | 5x6=9   |
| Q2   | A. Demonstrate how "Yeast episomal plasmid Vector" and "Yeast integrating plasmid vector" works. Which one of these is expected to produce a more stable yeast cell line.<br>B. Why and how is the amplified gene library prepared from a primary library?<br>C. What advantages does capillary electrophoresis provide in DNA sequencing?<br>D. Which development led to conducting four PCR sequencing reactions in a single tube? Explain the logic<br>E. Let you be given a task of preparing a gene library for gene identification and isolation of an eukaryotic organism? Which type of library would you prefer to prepare (genomic or cDNA)? Give three discrete arguments for your choice.<br>F. Draw a well labelled diagram of pUC vector? Explain basis of blue and white selection of transformed cells when using such vectors? | 1.5x6=9 |
| Q3   | a. Briefly explain life cycle of M13 bacteria phage, functional modules, working and unique advantages of vectors developed including phagemids from its genome. Draw suitable diagrams.<br>b. Discuss the factors and on which minimum number of clones to be maintained in the library depends. Calculate the minimum number of clones required in a gene library of rice? Given genome size $5.7 \times 10^2$ MB, fragment size 100 KB, desired probability of finding the fragment 0.95                                                                                                                                                                                                                                                                                                                                                     | 3x3=9   |
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | P.T.O.  |

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|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|    | c. What do you understand by screening libraries for gene identification and isolation by functional complementation. Give a brief account how the human gene responsible for a type of deafness trait was identified? |   |
| Q4 | Describe the structural organization of Ti plasmids and functional modules and working of i) co-integrated and ii) binary vector systems developed for plant transformation with suitable diagrams.                    | 4 |
| Q5 | Draw a well labelled diagram of pET expression vector system and analyze the molecular regulation of protein expression during growth and induction phase? What modifications were included in pET 11 vectors?         | 4 |

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