(3 Hours) **(100 Marks)**

Instructions to the candidates:

i) **All** questions are **compulsory.** Choice is **internal**
ii) Figures to **the right** indicate **full marks**.
iii) Draw structures and diagrams wherever necessary.
iv) Draw flowcharts /diagrams wherever necessary.

Q.1A) State true or false: **(04)**

i) All viruses have an envelope.
ii) *Pseudomonas* is a normal inhabitant of large intestine of humans.
iii) Climatic conditions influence the number of microorganisms in soil.
iv) *Clostridium* is a non-spore forming organism.

Q.1B) Write short notes on: (Any three) **(09)**

i) Symbiotic nitrogen fixation
ii) Classification of viruses based on symmetry
iii) *Haemophilus influenzae* infection
iv) Probiotics
v) Botulism
vi) Dysentry and cholera

Q.1C) Answer the following:(Any two) **(12)**

i) Give detailed account of normal flora of gut
ii) With the help of a neat labelled diagram explain the lysogenic and lytic lifecycles of viruses.
iii) Write an elaborate note on beneficial microorganisms and their significance.
iv) Discuss any two airborne diseases and their control.

Q2. A) State True or False: **(04)**

i) Crude media contains defined components.
ii) Septic conditions are necessary to eliminate contaminations.
iii) Culture systems are dependent on environmental factors.
iv) Secondary metabolites do not participate in metabolism of plants.

Q2. B) Answer the following: (**Any three**) **(09)**

i) What is the composition of nutrient agar? Mention use of each component.
ii) Differentiate between: Finite and continuous cell line.
iii) Define callus. Write a brief note on its application in plant tissue culture.
iv) Justify: 'Micropropagation is an important technique in plant tissue culture.
v) Mention the components required in growth media for animal tissue culture.
vi) In brief, explain production of vaccines as an application of animal tissue culture.

Q2. C) Answer the following: (A**ny two**) **(12)**

i) Schematically represent monoclonal antibody production.
ii) What are secondary metabolites of plant culture? Also, state their advantages, limitations and applications.
iii) Discuss different types of stem cells. Add a note on application of stem cell culture.
iv) Write a detailed account of protoplast fusion. Support your answer with diagrammatic representation of fusion products of protoplast.

Q.3A) State true or false: **(04)**

i) Head space is essential for proper fermentation.
ii) Immobilization increases effluent disposal problems.
iii) Urea biosensors are successfully used during renal surgery.
iv) Single cell protein can be prepared from waste raw materials.

Q.3B) Write short notes on: (Any three) **(09)**

i) Airlift fermenter
ii) Thermometric biosensor
iii) Stabilization of enzymes by polymer and salts
iv) Algal proteins
v) Principle and working of biosensor
vi) Coagulation aids

Q.3C) Answer the following: (Any two) **(12)**

i) Write a detailed account of wine production.
ii) Elaborate on various types of bacteria utilized for single cell protein production.
iii) Discuss entrapment and crosslinking as immobilization techniques.
iv) Give detailed account of continuous stirred tank fermenter. Add a note on its advantages and disadvantages

Q.4 (a) Define and explain: (Any five) **(10)**

(i) Explants (ii) Redifferentiation (iii) Viral genome (v) Putrefaction
(iv) Benthic microorganisms (v) Immunobiosensors (vii) Microbial biosensors

Q.4 (b) Attempt the following: (Any three) **(15)**

i) What are the advantages of tissue culture over *in vivo* study?
ii) Justify: "Cell culture is synchronous in earlier stages".
iii) Describe structure of a typical virus.
iv) Write an elaborate note on harmful microorganisms.
v) Give a detailed account of piezoelectric and optical biosensors.
vi) Elaborate on advantages and limitations of single cell proteins.

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