

Question Paper

Exam Date & Time: 28-Jun-2023 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M.Sc. (MEDICAL BIOTECHNOLOGY/TISSUE ENGINEERING/GENOME ENGINEERING/MOLECULAR BIOLOGY AND HUMAN GENETICS) DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MBT/MTE/MGE/MBH 502 - IMMUNOLOGY AND IMMUNOGENETICS
(OBE - 2021 REGULATION)

Marks: 70

Duration: 180 mins.

Answer all the questions.

Illustrate where necessary.

Answer the following questions in an essay format.

- 1) Describe various strategies employed by innate immune system to eliminate pathogens. (14)
- 2) Explain historical and biochemical evidence for immunoglobulin structure. Discuss antibody diversity. (14)

Answer the following questions in the form of a brief essay.

- 3A) Describe role of neutrophils in combating pathogens. (7)
- 3B) Describe IL-6 mediated JAK/STAT Pathway during inflammation. (7)
- 4A) What is haplotype? Describe inheritance of HLA haplotypes. (7)
- 4B) Describe classification and functions of major subsets of T cells. (7)

5. Answer the following with a brief note:

- 5A) MALT. (3.5)
- 5B) Resident macrophages. (3.5)
- 5C) Clonal ignorance. (3.5)
- 5D) Haptens and their role in immune system. (3.5)

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Question Paper

Exam Date & Time: 30-Jun-2023 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. GENOME ENGINEERING DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MGE 504 - SYNTHETIC BIOLOGY AND GENOME ENGINEERING: HEALTH AND DISEASE
(OBE - 2021 REGULATION)

Marks: 70

Duration: 180 mins.

Answer all the questions.

Illustrate where necessary.

- 1) Explain Immunodeficient mouse model and discuss genome engineering strategies to develop tyrosinemia mouse model. (14)
- 2) Describe in detail the principle, tools, and development of optogenetics in biomedical research. (14)

Explain the following briefly:

- 3A) Draw and explain operation of various biological gates used to fabricate gene circuits. (7)
- 3B) Principle and application of de novo genome assembly technology. (7)
- 4A) Describe various recombination-based method employed in directed evolution studies. (7)
- 4B) Define ex-vivo genome editing therapy and explain ex-vivo dual protection strategy to cure HIV infection. (7)

5. Write short notes on the following:

- 5A) Define Forward and reverse genetics. (3.5)
- 5B) Genome engineering strategies to enhance bioethanol production. (3.5)
- 5C) TALEN. (3.5)
- 5D) Ethical issue in genome editing. (3.5)

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Question Paper

Exam Date & Time: 05-Jul-2023 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. GENOME ENGINEERING/ M. Sc. SYSTEMS BIOLOGY/ M. Sc. MOLECULAR BIOLOGY AND
HUMAN GENETICS/ M. Sc. TISSUE ENGINEERING DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MGE 510/ MSB 510/ MBH 508/ MTE 508 - CANCER BIOLOGY
(OBE - 2021 REGULATION)

Answer ALL questions.
Illustrate where necessary

Marks: 70

Duration: 180 mins.

- 1) Write an essay on immune cell-based cancer therapy (14)
- 2) Explain the multistep processes of metastasis. (14)

3) Explain the following briefly:

- 3A) Write an essay on the molecular aetiology of breast cancer. (7)
- 3B) Elaborate on apoptosis pathway (7)
- 4A) Discuss the properties of cancer cell. (7)
- 4B) Write a note on molecular diagnosis of various cancers. (7)

5) Write short notes on the following:

- 5A) Cancer vaccines (3.5)
- 5B) Suicide gene therapy (3.5)
- 5C) Hereditary cancer syndromes. (3.5)
- 5D) APC gene (3.5)

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Question Paper

Exam Date & Time: 05-Jul-2023 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. BIOINFORMATICS / M. Sc. TISSUE ENGINEERING / M. Sc. MOLECULAR BIOLOGY AND HUMAN GENETICS / M. Sc. GENOME ENGINEERING DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MBI 508/ MTE 510 / MBH 510/ MGE 512 - MATHEMATICS AND R PROGRAMMING
(OBE - 2021 REGULATION)

Answer ALL questions.
Illustrate where necessary

Marks: 70

Duration: 180 mins.

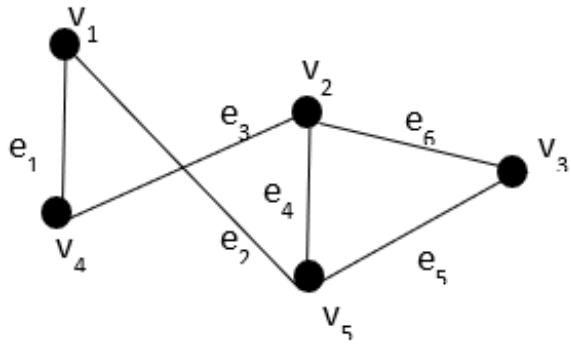
- 1) With an example, explain various types of plots and graphs in R (14)
- 2) With an example, add a note on R data structures. (14)

Explain the following briefly:

- 3A) What is the need of bioconductor packages? Explain the features of bioconductor packages (7)
- 3B) Let $U=\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A=\{1, 2, 3, 4\}$, $B=\{2, 4, 6, 8\}$. Draw Venn diagrams. Verify De Morgan's laws. (4)
 - i)
 - ii) How many words, with or without meaning can be made from the letters of the word WEDNESDAY, assuming that no letter is repeated if
 - a) 4 letters are used at a time
 - b) all letters are used at a time
 - c) are letters are used with first letter is a vowel.
- 4A) Solve the equations using Cramer's rule. (7)
 $x - y - 2z = 3$; $2x + y + z = 5$; $4x - y - 2z = 1$.
- 4B) Show that the following sequence is graphical. Also find a graph corresponding to the sequence (7)
5, 1, 2, 5, 2, 4, 3, 2.

5) Write short notes on the following:

- 5A) Using Logic Gates discuss AND and OR operations. (3.5)
- 5B) Solve the following equations by matrix method: (3.5)
 $7x + 6y - 5z = 30$; $3x - 4y + z = 0$; $x + 2y - 3z = 10$.
- 5C) "R is called dynamically typed language". Why? Explain the features of R statistical program. (3.5)
- 5D) Represent the graph shown below, with an incidence matrix. (3.5)



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