STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI- 86
(For candidates admitted during the academic year 2016 – 17 & thereafter)

SUBJECT CODE : 16VS/VA/MF45

B. Voc. DEGREE EXAMINATION, APRIL 2023
SUSTAINABLE ENERGY MANAGEMENT
FOURTH SEMESTER

COURSE : ALLIED CORE
PAPER : MICROBIAL FUEL CELLS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ALL QUESTIONS (30x1 = 30)

I. Choose the correct answer

1. What is the main function of a Microbial Fuel Cell?
   (a) To generate electricity using bacteria (b) To clean waste water
   (c) To produce biofuels (d) To purify air
2. Which type of microorganisms are commonly used in Microbial Fuel Cells?
   (a) Algae (b) Fungi (c) Bacteria (d) Protists
3. What type of material is typically used as the anode in a Microbial Fuel Cell?
   (a) Carbon (b) Platinum (c) Gold (d) Silver
4. How does a Microbial Fuel Cell generate electricity?
   (a) Through the use of enzymes (b) Through the use of chemical reactions
   (c) Through the use of bacterial metabolism (d) Through the use of solar energy
5. What is the main advantage of using Microbial Fuel Cells as a source of renewable energy?
   (a) inexpensive to produce (b) used in remote locations
   (c) treat waste while generating electricity (d) produce high voltage electricity
6. In what type of environment do Microbial Fuel Cells typically operate?
   (a) In a laboratory (b) In a sewage treatment plant
   (c) In a fuel refinery (d) In a solar panel farm
7. What is the role of the cathode in a Microbial Fuel Cell?
   (a) To provide oxygen for the bacteria
   (b) To act as a fuel source for the bacteria
   (c) To act as a barrier between the anode and environment
   (d) To generate electricity
8. What is the main limitation of using Microbial Fuel Cells as a source of renewable energy?
   (a) They require large amounts of water
   (b) They are only suitable for small scale power generation
   (c) They are dependent on specific types of bacteria
   (d) They produce a significant amount of waste
9. How does the efficiency of a Microbial Fuel Cell compare to other forms of renewable energy?
   (a) It is less efficient (b) It is more efficient
   (c) It is equally efficient (d) It is dependent on the type of bacteria used
10. What is the main goal of research in Microbial Fuel Cells?
   (a) To increase the efficiency of the cells
   (b) To develop new types of bacteria for use in the cells
   (c) To reduce the cost of production
   (d) All of the above

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II. Fill in the blanks

11. A fuel cell works by passing _____ through anode and _____ through cathode.
12. Fuel cells have _____ efficiency than diesel or gas engines.
13. _____ electrode-catalysts are needed in the phosphoric acid fuel cells.
14. A Microbial fuel cell is a bioreactor that converts _____ energy to electrical energy.
15. If the resistance of a fuel cell is _____, the performance of fuel cell will increase.
16. _____ is used to evaluate the toxicity level of wastewater effluents.
17. Efficiency of an alkali fuel cell is _____%
18. _____frequency response measurements include earthquakes and electroencephalography.
19. An _____ is a catalyst that participates in electrochemical reactions.
20. The unit of activation energy is _____.

III. Answer in a sentence or two

21. Define Fuel cell.
22. What are the classifications of a fuel cell based on its temperature?
23. What are the types of a mediator free microbial fuel cell?
24. Write any two disadvantages of a fuel cell.
25. Write any two baseline test conditions for a fuel cell.
26. Define Activation energy.
27. What are the applications of MFC?
28. Define Microbial fuel cell.
29. Mention any two sources of hydrogen.
30. What are the three risk factors in using hydrogen?

SECTION – B

Answer any SIX questions: **(6x5=30)**

31. Discuss why we need fuel cells.
32. Discuss the low temperature and high temperature fuel cells.
33. Tabulate the comparative study between traditional and microbial fuel cells.
34. Explain the Phosphoric Acid Fuel Cell (PAFC) with suitable diagram.
35. What are the components involved in a Traditional fuel cell and Microbial fuel cell.
36. Write a brief note on the history of a Microbial fuel cell.
37. Write a short note on CFD model.
38. Discuss the life cycle of a fuel cell with its schematic diagram.

SECTION – C

Answer any TWO questions: **(2x20=40)**

39. Discuss the following applications of MFC in detail
    a) Production of bioelectricity
    b) Bio-hydrogen Production
    c) Wastewater Management
    d) Biosensors
40. Discuss the working of a Traditional fuel cell and Microbial fuel cell in detail with its respective diagrams.
41. Discuss in detail the in situ and ex situ characterization of a fuel cell.
42. Write a detailed note on the fuel cell charge and mass transport.

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