B.Tech Even Semester Examination, May, 2025

Electronics & Communication Engineering

(4th Semester)

Course No: ECC-408

(Energy Science and Engineering)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

Note:

1. Attempt any five questions taking one from each unit.
2. Begin each answer in a new page
3. Answer parts of a question at a place
4. Assume reasonable data wherever required
5. The figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

UNIT-I

1. What are the potential consequences of lacking energy security, and how does it affect consumers in regions where markets do not function effectively? How do high energy prices impact economic development, consumer behavior, and resource innovation? What are energy services, and what components are required to deliver them within an energy system? Give an example of the energy chain from extraction to service. 5+2+2+2+3=14

2. Briefly discuss about energy related social issues. List the energy related environmental issues. 7+7=14

UNIT-II

3. Discuss the role of biomass in global energy supply, Illustrate the main biomass energy conversion routes with a diagram and discuss various methods of converting biomass into useful energy, and the associated environmental impacts. 4+3+5+2=14

4. Define geothermal energy and explain its four main types. Why is hydrothermal energy the only type currently method used on a commercial scale? What factor will most influence the future utilization of geothermal energy? 1+4+5+4=14

UNIT-III

5. Explain the movement of carbon through the Earth's land, water, and air systems, including a detailed description of the major carbon reservoirs and the processes by which carbon is exchanged between them. Discuss the role of autotrophs and heterotrophs in the carbon cycle. Furthermore, explain the process of carbon exchange between the atmosphere and ocean reservoirs, including the formation of carbonic acid, ionization into bicarbonate and carbonate ions, and the role of calcium carbonate in marine organism shells and the formation of limestone and provide relevant chemical equations to support your explanation. 3+5+6=14

6. What is the difference between direct and indirect emissions? What is the difference between direct and indirect GHG? Define is geopolitics? Discuss in brief. 2+4+2+6=14

UNIT-IV

7. Discuss the fundamentals of photovoltaic cell with neat IV-characteristic curve for a solar cell diagram. Give the Few design features of high efficient solar cells and the main factors which affect solar panel efficiency 8+3+3=14

8. Discuss Thin Film Solar Cells (TFSC) with different types, including Amorphous Silicon (a-Si), Cadmium Telluride (CdTe), Copper Indium Gallium Selenide (CIGS), and Dye-Sensitized Solar Cells (DSC). For each type, explain the materials used, their structural characteristics, and how they function in converting solar energy to electricity. 4+10=14

UNIT-V

9. Explain the stages of nuclear fuel cycle. How nuclear wastes can be handled for long period? Discuss the types of nuclear radiation. 5+5+4=14

10. What is an Energy Audit? Discuss the importance of energy Audit? Explain the two distinct phases of energy audit process. 4+5+5=14

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