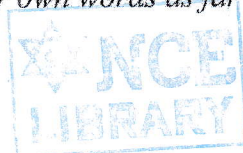


TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2082 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEI	Pass Marks	16
Year / Part	IV/ II	Time	1½ hrs.

Subject: - Energy Environment and Society (EX 757)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. What role do emerging technologies (for example AI and ICT) play in strengthening and transforming livelihoods in Nepal? [5]
2. Outline the current scenario of energy supply and demand situation in Nepal. What does it suggest in near term, medium term and long term? [5]
3. Sketch the simplified diagram of hydroelectric power generation system. Differentiate between the mechanism of impulse and reaction turbines. [3+4]
4. Design a solar PV roof top system to supply a power to telecommunication equipment and other accessories as indicated in table below. The system voltage is 48V DC but needs AC as output since the system has a utility room. The peak sun hour is 4.5hours, number of autonomy day required is 2 days, depth of discharge (DOD) is 70%, battery and inverter efficiencies are 85% and 93% respectively. [8]

SN	Appliances	Quantity	Operation Time (hours)	Power (W)
1	LED Bulb (Type 1)	1	24	5
2	LED Bulb (Type 2)	2	5 AM to 8AM 6PM to 10 PM	11
3	Router	1	24	13
4	Phone Charger	1	6PM to 8PM	33
5	Telecommunication equipment	1	24	1200

Draw a simplified layout of the system and

- a) Calculate daily load in Wh and peak power demand in W.
 - b) Calculate sizing of PV array with module peak power 330W_p.
 - c) Calculate battery sizing.
5. Discuss how the rural livelihood can be improved by using renewable sources of energy. [5]
 6. A 12 F super capacitor charged to 2 V is used as an energy storage element. Determine its stored energy and compare it with the energy capacity of a typical alkaline AA battery of 1.5 V, 2000 mAh. (Given 1 Wh = 3600 J). [4]
 7. In present context, due to growing demand of PV System and electric vehicles, the use of batteries is in rising trend. What challenge does this trend bring? Discuss possible solutions to address this issue. [6]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2082 Shrawan

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEI	Pass Marks	16
Year / Part	IV / II	Time	1½ hrs.

Subject: - Energy Environment and Society (EX 757)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. Define technology transfer. List out the positive and negative impacts of technology on society. [2+2]
2. Explain the role of energy in achieving Maslow's hierarchy of needs. What are the approximate percentages of Nepal's residential and industrial energy consumption, and what does it indicate? Explain. [2+2]
3. Briefly explain different types of hydropower plants on the basis of power output. [3]
4. List out the safety aspects of Hydrogen. Can fuel cells be an alternative to battery or petroleum fuel in transportation application? Explain briefly. [2+2]
5. Describe the working principle of the Solar Cell along with its IV characteristics curve. [4]
6. Design a solar PV system to run a router of 10 W and four LEDs of 5 W each. Router is operated 24 hrs daily and all LEDs are used for 9 hours daily. The voltage rating of Router and LED is 12 V DC. Assume peak sun of 4.5 hours and autonomy days of 2 days. Assume suitable data if necessary, while designing your system,
 - a) Calculate daily load in Ah [1]
 - b) Calculate sizing of PV array [2]
 - c) Calculate battery sizing [2]
 - d) Calculate size of charge controller [1]
 - e) Draw a simplified layout of the system. [2]
7. Discuss the application of solar electricity for drinking water pumping applications to improve rural livelihood. [4]
8. Discuss the environmental impact of energy sources. [3]
9. Write short notes on: (Any Two) [2×3]
 - a) Smart Grid System
 - b) Lead Acid vs Lithium Ion Battery
 - c) Hybrid Vehicles

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEI	Pass Marks	16
Year / Part	IV/ II	Time	1½ hrs.

Subject: - Energy Environment and Society (EX 757)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. What do you mean by Technology? Which technology could be appropriate in Nepalese context for cooking purpose especially in hilly areas? Explain. [2+2]
2. Define HDI along with its formulae. Explain the relationship between HDI and Energy Consumption. [2+2]
3. Draw I-V and P-I curve for solar PV with respect to change in panel temperature. [4]
4. Explain the working principle of PEM fuel cells with neat sketch. [4]
5. Design a solar PV system to run various devices with the quantity, power rating and operating hours as indicated in the following table: [4×2]

S.N.	Description	Quantity	Power Rating (W)	Operating Hours (per day)
1	LED bulb	2	7	10
2	Television 35"	1	40	4
3	Laptop	1	65	4
4	Router	1	12	24
5	Cellphone Charger	2	25	2

Assuming Peak Sun of 4.5 hours, days of autonomy = 2, deep cycle battery with 90% efficiency, system voltage to be 12 V, draw a simplified layout of the system and calculate

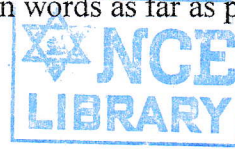
- a) Daily load in Ah
 - b) Sizing of PV array (assume suitable module)
 - c) Battery Sizing
6. What are the various applications of solar technology in remote area of Nepal? Explain the methods by which the rural livelihood could be improved in terms of food, water and energy nexus. [2+3]
 7. List down the properties of Energy storage devices. Can super capacitor be an alternative of battery in energy storage? Justify your answer. [3+2]
 8. Write short notes on: (Any Three) [3×2]
 - a) Energy Conservation and Energy Efficiency
 - b) Nuclear Hazard
 - c) EIA
 - d) V2G and G2V

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEI	Pass Marks	16
Year / Part	IV / II	Time	1 1/2 hrs.

Subject: - Energy Environment and Society (EX 757)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. What do you mean by appropriate technology? List down the features of appropriate technology. Give an example of appropriate technology for cooking purposes in context of the urban areas of Nepal. [1+1+2]
2. Describe the importance of energy in achieving Maslow's hierarchy of needs. Define HDI and describe the relationship between HDI and Energy consumption with a suitable diagram. [2+3]
3. Calculate the power output from the wind turbine. [3]
Given data:
Blade length = 49 m
Wind speed = 10 m/s
Air density = 1.23 Kg/m³
Power Coefficient = 0.45
4. How does hydropower plant work? Draw the schematic diagram of hydropower plant showing various components. Write down the name of the various turbines used in hydropower stations in Nepal. [2+2]
5. Design a Solar PV system to supply a constant power for telecommunication equipment of 1000 Watt for 24 hours a day. The operating voltage of equipment is 48V DC. Given peak sun hour is 4 hours and DOA 2 days. Assume other suitable data whenever is necessary. [1+2+2+1+2]
While designing your system,
 - a) Calculate daily load in Ah.
 - b) Calculate sizing of PV array.
 - c) Calculate battery sizing.
 - d) Calculate the size of charge controller.
 - e) Draw a simplified layout of the system.
6. What are the various applications of solar technology in rural areas? Explain the methods by which the rural livelihood could be better in terms of cooking using solar technology. [2+3]
7. Differentiate between battery and fuel cell. [3]
8. Define Energy Storage. List out the different form of energy storage. [1+1]
9. Write short notes on:(Any Two) [2×3]
 - a) Emission Hazard
 - b) Battery Hazard
 - c) Nuclear Hazard

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEI	Pass Marks	16
Year / Part	IV / II	Time	1 ½ hrs.

Subject: - Energy, Environment and Society (EX 757)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.



1. Mention the impact of technology in modernizing the society. Briefly explain with appropriate examples. [4]
2. Differentiate between conventional and non-conventional energy sources. Which sources are relevant for sustainable development? [3+1]
3. Show the block diagram of a Hydro Power Station and mention the importance of each block. Why is Hydro Power so important for the society? [3+1]
4. How can you produce hydrogen using one of the renewable energy sources? How can you use hydrogen in environmentally friendly society? [2+2]
5. Explain how can you power 15 laptops (50 watt, 220 V AC) at a school without National Grid for 6 hours per day. Mention basic steps needed. [3+4]
6. Which type of renewable energy source would you use to power 200 watt Base Transmitting Station (BTS) for 20 hours per day? Mention the basic parameters required for the energy source you have suggested. [3+3]
7. Explain how solar electricity can be used for drinking water supply in remote areas. [3]
8. How can super capacitors replace lead acid battery? [4]
9. What are the disadvantages of Nuclear Power Stations? [4]
