





KATHMANDU UNIVERSITY  
End Semester Examination  
June/July, 2023

14 JUL 2023

Level : B.E.  
Year : I  
Time : 2 hrs. 30 mins.

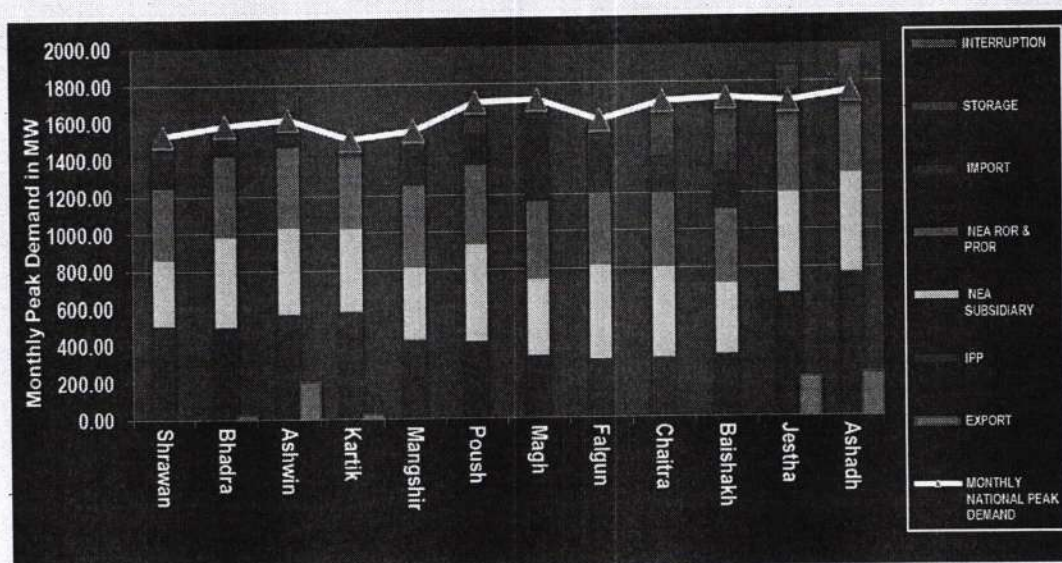
Course : MEEG 156  
Semester : I  
F. M. : 55

SECTION "B"  
[11Q. × 5 = 55 marks]

Attempt *ALL* questions. Assume suitable data if missing.

1. Explain the working mechanism of Pump Storage project with appropriate figure.
2. Name any 5 existing hydropower plants of Nepal and 5 under construction or planned projects. Write the installed capacity of any 3 of them.
3. Explain the various steps involved in obtaining the hydropower survey license in Nepal using a flowchart.
4. The picture below is extracted from Nepal Electricity Authority annual report of FY 2021/2022. Based on the picture, explain how the peak demand is fluctuating over the year in Nepal. Also explain the overall scenario of export and import of the electricity in the country.

Capacity Balance (MW) in FY 2078/79(2021/22)



5. Provide classification of hydropower plants based on their size (installed capacity). Also, mention the size of these power plants according to Nepalese standard.
6. Draw a typical turbine selection chart that includes head (y-axis) and flow (x-axis) of the hydropower. Indicate the tentative location of Pelton, Francis and Kaplan turbines in the curve.

7. List the components that would be available in the head works of a power plant. Explain the role of any 2 of them.
8. How are gates classified based on the head? What are different design conditions associated with gates and stop logs?
9. Sketch the sectional view of a Francis turbine and indicate the following components:
  - Stay vanes
  - Guide vanes
  - Runner
  - Spiral casing
  - Draft tube
10. Explain the role of Spiral casing and Stay vanes in Francis turbines. Also explain how guide vanes help to regulate flow at various operating conditions.
11. A pumped storage power plant is designed having the difference in the lower and upper reservoir of 200 meters at free water surface level. The rated flow for both turbine and pump mode is  $2 \text{ m}^3/\text{s}$  and the overall efficiencies of the plant were 72% and 68% for turbine and pump mode respectively. To compensate the financial loss of the plant while operating at two modes, the selling cost of electricity in the turbine mode needs to be more than the normal cost. If the plant operates for 4 hours in turbine mode and 5 hours in pump mode daily, calculate the minimum selling cost of electricity in the turbine mode if the normal cost is NRs. 10 per unit.