KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2025

Marks Scored:

Level : B.E.
Year : I

Course : MEEG 156
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

15 APR 2025

Registration No.:

Date : 15 APR 2025

SECTION "A"
[20Q. × 1 = 20 marks]

Choose the most appropriate answer and **Mark [X]**.

1. Which of the following is not a renewable source of energy?
[ ] Hydropower [ ] Solar energy [ ] Coal [ ] Wind energy

2. A hydropower plant has the installed capacity of 3 kW. This power plant can be classified as:
[ ] Pico hydro [ ] Mini hydro [ ] Small hydro [ ] Large hydro

3. What is the general layout of a hydropower plant:
[ ] Water intake, turbine, generator, tailrace
[ ] Coal chamber, boiler, turbine, generator
[ ] Solar panels, inverter, battery
[ ] Windmill, rotor, gearbox, generator

4. Typical head range for a medium head power plant is :
[ ] Less than 10 m [ ] Less than 40 m [ ] 40 – 100 m [ ] More than 100 m

5. Which of the following turbine is most suitable for high head applications?
[ ] Francis [ ] Kaplan [ ] Pelton [ ] Propeller

6. Which of the following hydropower components are NOT found in the powerhouse?
[ ] Turbine [ ] Hydraulic Gates [ ] Forebay [ ] Generator

7. What is purpose of surge tank in hydropower system?
[ ] To store electricity
[ ] To regulate water flow and reduce pressure fluctuations
[ ] To generate electricity
[ ] To provide cooling to the generator

8. Which of the following is **NOT** the component of Pelton turbine system?
[ ] Buckets [ ] Deflector [ ] Poles [ ] Nozzle

9. Which of the following is Nepal's second largest hydropower plant in operation in terms of capacity:
[ ] Middle Marshyangdi HPP [ ] Upper Tamakoshi HPP
[ ] Kaligandaki HPP [ ] Paschim Seti HPP

10. A component of water conveyance system is referred as steel liner when:
[ ] it is exposed on surface [ ] it is embedded in concrete
[ ] it is made of wood [ ] it is coated with ceramic

11. The change of a magnetic flux through a coil induces:
[ ] Magnetic force [ ] EMF
[ ] Rotational motion [ ] RMS

12. What is a black start capability in a hydropower plant?
[ ] Ability to restart without external grid power
[ ] Shutting down the plant at night
[ ] Increasing generator speed
[ ] Reducing power

13. In a tank, water is filled up to the height of 40 m. The pressure at the bottom is approximately equal to:
[ ] 400 kPa [ ] 4000 kPa [ ] 40 kPa [ ] 400 Pa

14. The capacity of Upper Tamakoshi hydropower project is:
[ ] 144 MW [ ] 456 MW [ ] 900 MW [ ] 20 MW

15. Submergence is required in which of the following types of turbines?
[ ] Francis [ ] Pelton [ ] Cross flow [ ] Turgo

16. Which of the following is a hoisting equipment?
[ ] Gantry Crane [ ] Poles [ ] Runner [ ] Butterfly Valve

17. Which of the following valve is used in medium to low head application in hydropower plants?
[ ] Butterfly Valve [ ] Spherical Valve [ ] Gate Valve [ ] None

18. Which of the following type of power plant operates without any water storage?
[ ] RoR without pondage [ ] PROR
[ ] Storage [ ] Pump storage

19. The length of an expansion joint is 2 m. The maximum change in length of the expansion joint is 0.027 meter. The thermal expansion coefficient of material is 9×10^{-4} m/°C. The maximum variation of the temperature is
[ ] 15 ^{0}C [ ] 10 ^{0}C [ ] 25 ^{0}C [ ] 0.5 ^{0}C

20. Which of the following is not a type of Hydraulic Gate?
[ ] Sleeve gate [ ] Slide gate [ ] Radial gate [ ] Flap gate

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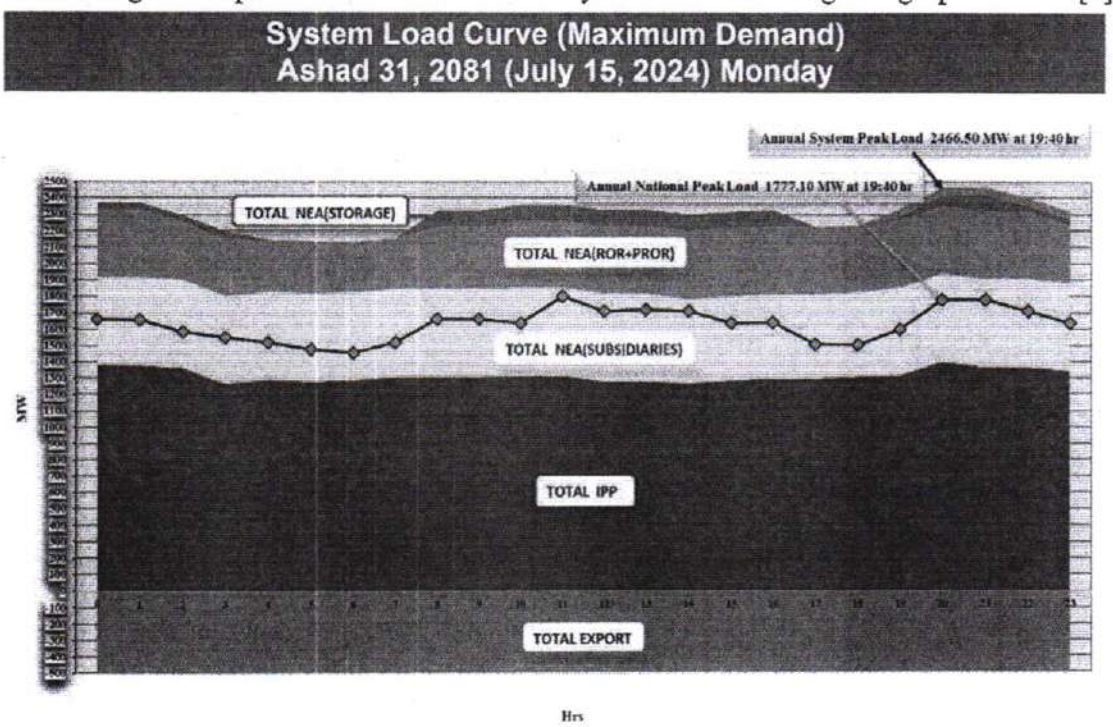
SECTION "B"
[11Q. × 5 =55 marks]

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

1. Name a hydropower project which is under construction and is planning to develop a pumped hydro station? Explain with well labelled diagram about the pumped storage scheme for hydro power plants. [1+4]

2. Why are expansion joints used in hydropower plants? Sketch a well labelled diagram of expansion joints and explain its types. What is the use of a bifurcation? [1+3+1]

3. Comment on the following graph which represents the System load curve of the day as shown in figure. Explain what conclusions can you draw form the given graph. [5]



P.T.O.

4. Following figure is extracted from Energy Synopsis Report, 2024 produced by Water and Energy commission secretariat of Nepal. The pie chart shown here represents sectoral energy consumption share in Nepal. Mention the sector that consumes the largest share of energy in Nepal? What is the share of Agriculture? What conclusions can you draw from the chart? [1+1+3]

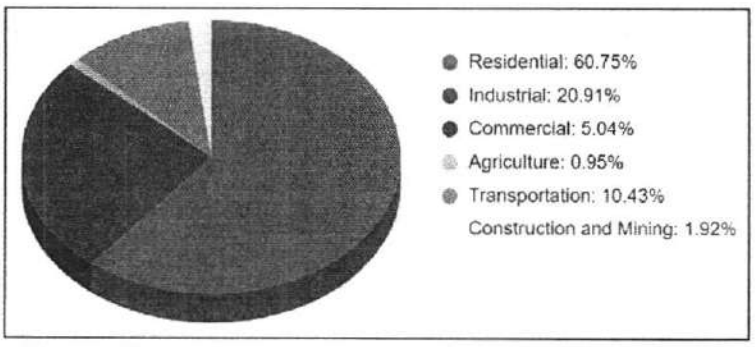


Figure: Sectoral energy consumption share for FY 79/80

5. Explain the use of a hydraulic turbine? What is the basis of selection of hydraulic turbines? Point out the major differences between Pelton and Francis turbine. [1+1+3]

6. Explain the working principle of an Impulse Turbine. Draw a labelled diagram of Pelton Turbine system and label the runner, nozzle, casing, bucket and brake jet. [5]

7. What is a valve? Explain different types of valves used in hydropower plant. [5]

8. Explain the role of generator, excitation transformer and generator circuit breaker. List the auxiliary systems of a power plant. [2+3]

9. What is a governor? What are the functions of a governor? Explain the working of a governor with a block diagram. [1+1+3]

10. What is a hydraulic gate? Give short notes on flap gate, sliding gate and radial gates. [1+4]

11. Name the three largest hydropower plants under operation of Nepal and explain features of any 2 of them. [5]