KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks Scored:

Level : B. E.
Year : IV

Course : MEPP 439
Semester : I

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No. :

Date : APR 0 7 2017

SECTION "A"
[20 Q. × 1 = 20 marks]

Tick the most appropriate answer.

1. Water hammer is developed in
[ ] penstock [ ] draft tube [ ] turbine [ ] surge tank

2. The annual depreciation of a hydropower plant is about
[ ] 0.5 - 1.5 % [ ] 10 - 15 % [ ] 15 - 20 % [ ] 20 - 25 %

3. Location of surge tank in a hydropower plant is near to the
[ ] tailrace [ ] headrace [ ] turbine [ ] reservoir

4. In Nepal, penstock pipe materials are mainly
[ ] mild steel and HDPE [ ] steel and HDPE
[ ] concrete and HDPE [ ] wood and HDPE

5. Coffer dam is
[ ] permanent dam [ ] concrete dam
[ ] Earthern dam [ ] temporary dam

6. Which of the following component is not a hydro mechanical component of hydropower plant?
[ ] gate [ ] trace rack [ ] surge shaft [ ] penstock

7. Which of the following hydropower project with penstock started from the surge tanks in Nepal?
[ ] Trishuli HPP [ ] Devighat HPP
[ ] Sunkoshi HPP [ ] Marsyangdi HPP

8. V-shaped narrow valley is suitable for
[ ] Rockfill dam [ ] Overflow concrete dam
[ ] Arch dam [ ] Earthen dam

9. A pumped storage hydroelectric plant is a
[ ] high head plant [ ] run-off river plant
[ ] base load plant [ ] peak load plant

10. In hydel installation, power generation is calculated on the basis of
[ ] gross head [ ] rated head [ ] net head [ ] design head

11. Run off river plant is one which
[ ] has no pondage at all [ ] is a high head plant
[ ] is a pump storage plant [ ] has a limited pondage

12. A 30 km transmission line carrying power at 33 kV is known as
[ ] short transmission line [ ] medium transmission line
[ ] high power line [ ] ultra high voltage line

13. The closing member of the gate is leaf and it does not consists of
[ ] seal bases [ ] girders [ ] stiffeners [ ] skin plate

14. The groove embedment on which the gate leaf runs does not consists of
[ ] wheel track [ ] pin [ ] guides [ ] anchor bolts

15. Which of the following is not a hoisting arrangement of gate?
[ ] chain [ ] lift beam [ ] wheel track [ ] counter weight

16. Rated voltage for 501 to 2500 kW is
[ ] 3.3 kV [ ] 6.6 kV [ ] 11 kV [ ] 415 V

17. Choice of generator configuration in hydropower plant is based on
[ ] design head, location, size of power house [ ] size of power house
[ ] design flow, location, size of power house [ ] location and size of power house

18. Number of crane for sizing a power house is decided primarily on
[ ] rotor weight only [ ] rotor weight and runner weight
[ ] rotor weight and MIV weight [ ] rotor weight and number of unit

19. MIV diameter is generally kept _____ to the inlet diameter of the spiral/distributor.
[ ] equal [ ] half [ ] double [ ] four times

20. UAT is used for supplying_____ to unit auxiliary board (UAB)
[ ] 415 v, 3-phase supply [ ] 3.3 kV, 3-phase supply
[ ] 6.6 kV, 3-phase supply [ ] 11 kV, 3-phase supply

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APR 0 7 2017

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

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Semester : I
F. M. : 55

SECTION "B"
[5 Q. × 11 =55 marks]

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

1.
a. What are the major institutions involved in hydropower development sector of Nepal? Explain their roles in brief. [4]
b. Explain the project development cycle of hydropower projects? What are the different activities, studies, investigations to be carried out in those stages? [4]
c. What are the different challenges faced by the hydropower development sector and hydropower investors in Nepal? [3]

2.
a. What are the functions of gates in hydropower plants? Classify them and discuss the main component parts of radial gate. [4]
b. Enumerate and explain the various factors that govern the selection of type of dam. What points should be considered while selecting site for the dam? [4]
c. What are the hydraulic and structural difference between Barrage and Dam? [3]

3.
a. What are penstocks and of which material can they be manufactured? Under what circumstances each material can be used? [2]
b. What is the function of anchor blocks? What are the forces which should be taken into account in their stability analysis? [2]
c. Panauti hydropower plant is an old hydropower plant in Nepal having gross head 60 m, design discharge 4.83 m^3/s, rated power 2.4 MW, rotational speed 1000 rpm, length of the cannel 3.721 km, length of the pipe 370 m, diameter of pipe 1.4 m. Assumed total plant efficiency 85 %, main valve closure time 10 s and the pipe material is St 37 steel. Material properties for the steel are assumed as; speed of sound 1200 m/s and density of steel is 7800 kg/m^3. Assumed kinematic viscosity of water 1.308 $x10^{-6}$ m^2/s and density of water 1000 m^3/s. The open air steel pipe from the reservoir to the power plant is old, and so they need your help to calculate and design a new one. It is assumed that steel is chosen as the new pipe material. Based on the existing plant data, calculate as follows:
   - head loss in the pipe at design output by assuming f = 0.015
   - dimensioning pressure that you will use when you find the thickness of the existing pipe
   - thickness of the existing pipe.
   - economically correct pipe diameter for Panuati hydropower plant. The price of steel is NPR 70/kg and the price for the energy is NPR 10/kWh. Assume a lifetime of 20 years and an interest rate of 5 %.
   - based on the optimal pipe diameter you have calculated, calculate the head loss and thickness in the new pipe. [7]

4.
a. What are the special considerations in estimating the cost of hydropower projects? What are different stages of cost estimation of E&M works?
b. Define and differentiate between dewatering system and drainage system in hydropower plants? [
c. What is EOT Crane? What are the types of hooks and their functions?

5.
a. Write down the Francis turbine components with their materials. Briefly explain their manufacturing techniques? [4]
b. How do you justify the statement that sediment erosion is a technical challenge for hydropower development in Nepal? [4]
c. What do you mean by environmental assessment of hydropower project? What are the criteria for IEE or EIA for hydropower project in Nepal? [3]