KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks scored:

Level : B. E.
Year : IV

Course : MEPP 439
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 05 MAR 2019

SECTION "A"
[20 Q. × 1 = 20 marks]

Tick the most appropriate answer. Use of formula sheets are not allowed in this exam.

1. The area under the flow duration curve represents
   [ ] the total units of energy available
   [ ] the total quality of run off during that period
   [ ] total power available
   [ ] total storage of the plant

2. The location of surge tank is close to _____
   [ ] tailrace [ ] dam [ ] turbine gate [ ] spillway

3. Which of the following is not a requirement for site selection of hydroelectric power plant?
   [ ] availability of water [ ] large catchment area
   [ ] rocky land [ ] sedimentation

4. Hydroelectric power plant is _____
   [ ] non-renewable source of energy [ ] conventional source of energy
   [ ] non-conventional source of energy [ ] continuous source of energy

5. Hydroelectric power plant is mainly located in _____
   [ ] flat areas [ ] deserts [ ] hilly areas [ ] deltas

6. Which statement about hydroelectric power plant is wrong?
   [ ] efficiency of hydroelectric power plant does not reduce with age
   [ ] its construction coast is very high and takes a long time for erection
   [ ] it is very neat and clean plant because no smoke or ash is produced
   [ ] meeting rapidly changing load demands is not possible in hydroelectric power plant

7. Which element of hydroelectric power plant prevents the penstock from water hammer phenomenon?
   [ ] valves and gates [ ] draft tubes [ ] spillway [ ] surge tank

8. Dam having very wide base as compared to its height is called _____
   [ ] buttress dam [ ] arch dam
   [ ] earth dam [ ] solid gravity dam

9. Trash racks are located _____
   [ ] near tailrace [ ] at the entrance of turbine
   [ ] inside penstock [ ] intake

10. What is the function of booms?
[ ] it supports the dam
[ ] it supports the penstock
[ ] it divert the icebergs from flowing into the penstock
[ ] to hold the turbine structure

11. Permissible leakage for small and medium head gate is _____ liter per minute per meter length of seal
[ ] 4 [ ] 3 [ ] 5 [ ] 10

12. Screw spindle hoisting system is used if gate weight is_____ hoisting load required
[ ] greater than [ ] less than [ ] equal to [ ] all of above

13. Expansion joints in steel pressure pipe are used to resist
[ ] longitudinal stress [ ] radial stress
[ ] hoop stress [ ] both longitudinal and radial stress

14. Sickle plate for internal reinforcement of penstock bifurcation is designed so that it is _____
[ ] always in tension [ ] always in compression
[ ] always in Shear [ ] always in torsion

15. Usual operation of hoisting used for gates and stop-logs are in the range of
[ ] 0.3 m/min-0.7 m/min [ ] 3 m/min to 7 m/min
[ ] 0.03 m/min to 0.07 m/min [ ] 30 m/min to 70 m/min

16. Which type of gate are suitable for partial opening
[ ] fixed wheel vertical lift [ ] radial
[ ] slide [ ] miter

17. Deceasing the bifurcation angle will _____head loss due to bifurcation
[ ] increase [ ] have no effect on
[ ] first decrease then increase [ ] decrease

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

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

20. 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

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

05 MAR 2019

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

Course : MEPP 439
Semester: I
F. M. : 55

SECTION "B"
[5 Q. × 11 =55 marks]

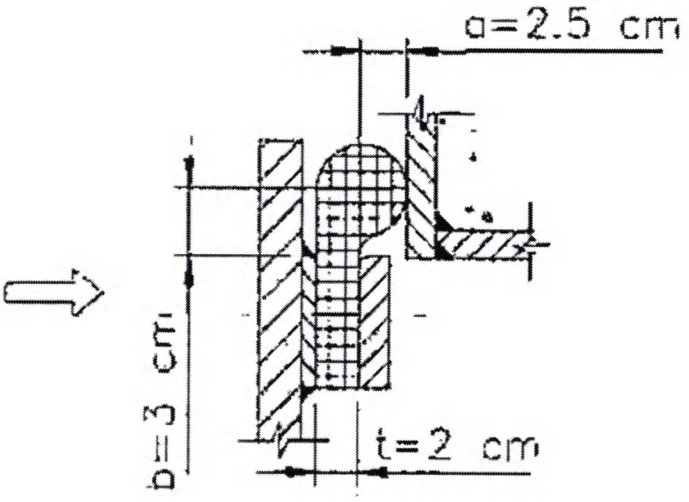
Attempt *ALL* questions. Assume suitable data if missing/necessary. Use of formula sheets is allowed in this exam.

Q. N. 1

a. If you are developing 40 MW RoR project in Nepal, what are the steps of study to be followed from planning to commissioning stage of development? Briefly describe the level of study. [4]
b. Write short notes on development and uses of flow duration curve. [4]
c. What are the different challenges faced by the hydropower development sector and hydropower investors in Nepal? [3]

Q. N. 2

a. Explain about the types of hoisting system used for hoisting of gates with their advantages. [2]
b. How many types of pressure pipe expansion joint are used in hydropower? Explain the importance of expansion joints in pressure pipe. [3]
c. Determine the operating forces of fixed wheel gate which have seal span of 5.5 m and seal height of 7.9 m. The seal pre- compression is 5 mm. The gate weighs 320 kN and is equipped with 36 cm dia. Wheel assembled on roller bearings with mean diameter of 22 cm. The hardness of wheel rolling surface is 250 BHN, side seal and top seal are music note type and arranged as per Figure below. [6]



Q. N. 3

a. Define and differentiate between the load factor, utilization factor and plant factor and briefly explain their significance. [3]

b. What is the function of anchor blocks? What are the forces which should be taken into account in their stability analysis? [2]

c. Mean monthly flow in m^3/s for Nepalese river is shown below.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
40	35	30	25	20	38	75	95	70	55	50	45

Determine the best installed capacity with the given data.

Interest rate	= 13 %
Energy price	= U$40/MWH
Fixed cost	= U$2800/kW
Variable cost	= U$650/kW (electromechanical)
O & M	= 2.5 % of variable cost
Economic life of plant	= 45 years
Net head	= 50 m
Overall efficiency of the system	= 85 %

[6]

Q. N. 4

a. Write down the important unit auxiliaries and station auxiliaries used in hydropower plants? Distinguish between them. Briefly explain one each auxiliaries. [4]

b. Define and differentiate between dewatering system and drainage system in hydropower plants? [3]

c. A steel penstock pipe 500 m long with and internal diameter 0.4 m supplies water at a rate of 1 m^3/s with the static head of 100 m. Pressure wave velocity due to dynamic surge pressure development is 940 m/s. Allowable design stress of the pipe materials is 130 MPa and joint efficiency 85 %. Find the wall thickness of penstock pipe if gate closure time is 40 sec.? [4]

Q. N. 5

a. Write down the major features of Panauti hydroelectric power station. What are the different types of electromechanical equipment used there? Explain them briefly. [4]

b. What do you mean by environmental assessment of hydropower project? What are the criteria for IEE or EIA for hydropower project in Nepal? [3]

c. A power station has to supply the following loads on an average day. Draw the load duration curve and calculate the daily load factor. What will be the plant capacity factor and utilization factor if it has reserved capacity of 1000 kW?

Time	11 PM to 5 AM	5 AM to 6 AM	6 AM to 7 AM	7 AM to 9 AM	9 AM to 12 AM	12 AM to 1 PM	1 PM to 5 PM	5 PM to 7 PM	7 PM to 9 PM	9 PM to 11 PM
Load (kW)	500	750	1000	2000	2500	1500	2500	2000	2500	1000

[4]