

M.TECH/RE /3<sup>RD</sup> SEM/ REEN 6102/2017  
RENEWABLE ENERGY III  
(REEN 6102)

Time Allotted : 3 hrs

Full Marks : 70

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group - A**  
**(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following:  $10 \times 1 = 10$
- (i) Benefit of hydropower is  
(a) it is unlimited.  
(b) it is clean; it doesn't release pollutants or greenhouse gases.  
(c) it is generated without disrupting the river's flow or its ecosystem.  
(d) all of these.
- (ii) Which of the following is not part of a hydroelectric plant?  
(a) Turbine (b) Powerhouse (c) Penstock (d) Outtake.
- (iii) The flow-mass curve is graphical representation of  
(a) cumulative discharge and time  
(b) discharge and percentage probability of flow being equalled or exceeded  
(c) cumulative discharge, volume and time in chronological order  
(d) discharge and time in chronological order.
- (iv) The stream which does not have any base flow contribution is called  
(a) perennial stream (b) intermittent stream  
(c) ephemeral stream (d) none of the above.
- (v) Non-recording rain gauges  
(a) collect the rain whose volume is measured by means of graduated cylinders  
(b) collect the rain which is directly measured by means of graduated cylinders in centimetres of water depth  
(c) are generally used in hilly terrain  
(d) are cylindrical in shape.

M.TECH / RE /3<sup>RD</sup> SEM/ REEN 6102/2017

- (vi) Hydrograph is a graphical representation of  
(a) surface run off (b) ground water flow  
(c) rain fall (d) discharge flowing in the river.
- (vii) Pelton turbine is suitable for  
(a) high head and low discharge (b) high head and high discharge  
(c) low head and high discharge (d) low head and low.
- (viii) Surge tank is for the protection of  
(a) dam (b) spillways (c) penstock (d) headworks.
- (ix) A draft tube is not required for  
(a) francis turbine (b) kaplan turbine  
(c) pelton wheel turbine (d) none of the above.
- (x) Which of the following machines have the possibility of cavitation?  
(a) Reaction turbines and centrifugal pumps  
(b) Reaction turbines and reciprocating pumps  
(c) Impulse turbines and centrifugal pumps  
(d) Impulse turbines and reciprocating pumps.

**Group - B**

2. (a) What is hydrologic cycle? Explain with a suitable diagram.  
(b) Briefly discuss about the different tools for water resource planning and management.
- 6 + 6 = 12**
3. (a) What is run-off? What are the factors affecting run-off?  
(b) Discuss the site selection criteria of a SHP.
- 6 + 6 = 12**

**Group - C**

4. (a) Discuss about the design requirement of canal and penstock intakes.  
(b) Draw a typical layout of a canal design for small hydro plants.
- 6 + 6 = 12**
5. (a) What is desilter? Briefly discuss different elements of a desilter.  
(b) What are the main functions of a surge tank? Briefly explain.
- 6 + 6 = 12**

**Group - D**

6. (a) Briefly explain the different components of a hydro-generator.

(b) What are the different functions of an excitation system?

**6 + 6 = 12**

7. (a) What are the main functions of hydraulic governor systems? Draw a typical hydraulic governor system.

(b) Briefly discuss about the digital control and protection system in hydro-electric power station.

**6 + 6 = 12**

**Group - E**

8. (a) Discuss the operating characteristics of hydro-turbine.

(b) Write a short note on pump as turbine (PAT).

**6 + 6 = 12**

9. (a) What is cavitation? Discuss its impact on hydro-turbines.

(b) Discuss about the different factors affecting the selection of hydro-turbines of above 5 MW.

**6 + 6 = 12**