

MIZORAM PUBLIC SERVICE COMMISSION

DEPARTMENTAL EXAMINATIONS FOR JUNIOR GRADE OF M.E.S. (AE/SDO) UNDER POWER & ELECTRICITY DEPARTMENT, SEPTEMBER, 2018.

CIVIL ENGINEERING PAPER – II

Time Allowed : 3 hours

FM : 100 PM : 40

*The figures in the margin indicate full marks for the questions.
Attempt all questions.*

1. Answer any 10 (ten) of the following:

(10×5=50)

- (a) What is stream gauging? Describe different methods of stream gauging.
- (b) What are the design principles of earth dams? What are the advantages of earthen dams over concrete gravity dams?
- (c) What are the major components of a hydroelectric plant? Briefly describe the major components.
- (d) Describe in brief the types of hydraulic turbines with the working principles of each type and give example of each type.
- (e) Describe in brief draft tube and tail race with neat sketches.
- (f) What is power potential of a river? What are the criteria for evaluation of power potential of a river?
- (g) Briefly describe the classifications of hydroelectric plants based on hydraulic characteristics.
- (h) Two generators each of capacity 25,000 kW have been installed at a hydel power station. During a certain period, the load on the hydel plant varies from 15,000kW to 40,000kW. Calculate i) the installed capacity ii) the load factor iii) the plant factor and iv) the utilization factor.
- (i) A run-of- river is proposed at the site where a net head head of 25m is available on the turbine. The river carries a sustained minimum flow of 30m³/sec in dry weather and behind the power station, sufficient pondage is provided to supply daily peak load of demand with a load factor of 71%. Taking the plant efficiency to be 56.40%, determine the maximum generating capacity of the generator to be installed at the power house.
- (j) Write the differences between Ogee Spillway and Siphon Spillway.
- (k) Using Dicken's empirical formula, calculate the peak run-off from a catchment area of 12.5 sq. km. Take the value of the constant in the empirical formula as 0.75
- (l) The blasting ratio of an explosive is 4cu.m per kg. 10 jack hammer holes are expected to break 20 cu.m of medium hard rock. Calculate the charge required in each hole.

2. Choose the correct answer

(10×2=30)

- (a) The force exerted by a jet on a curved plate is
 - (i) less than that on a flat plate
 - (ii) equal to that on a flat plate
 - (iii) more than that on a flat plate
 - (iv) sometimes more and sometimes less than that on a flat plate
- (b) An impulse turbine
 - (i) always operate submerged
 - (ii) makes use of a draft tube
 - (iii) is most suited for a low head operation
 - (iv) operates by initial complete conversion to kinetic energy
- (c) Francis turbine is
 - (i) a impulse turbine
 - (ii) a reaction turbine
 - (iii) a tangential flow turbine
 - (iv) an axial flow turbine
- (d) Kaplan turbine is
 - (i) a high head axial flow turbine
 - (ii) a mixed flow turbine
 - (iii) a low head axial flow turbine
 - (iv) an impulse turbine
- (e) Cavitation is caused by
 - (i) high velocity
 - (ii) low barometric pressure
 - (iii) low pressure
 - (iv) high pressure
- (f) If a hydro plant operates under a head of 100m, it may be classified as
 - (i) Medium head plant
 - (ii) Very high head plant
 - (iii) High head plant
 - (iv) Low head plant
- (g) Hydraulic jump is expected when the slope a channel changes from
 - (i) steep to mild
 - (ii) steep to steeper
 - (iii) mild to steep
 - (iv) mild to milder
- (h) Run-of-river plants are usually
 - (i) Low head plants
 - (ii) Medium head plants
 - (iii) High head plants
 - (iv) Very high head plants
- (i) Two turbo generator have each of installed capacity of 20,000kW. The load on the hydel plant varies from 10,000kW to 30,000kW during a certain period. The utilisation factor is
 - (i) 50%
 - (ii) 75%
 - (iii) 80%
 - (iv) 100%
- (j) A normal shockwave is analogous to
 - (i) An elementary wave in still liquid
 - (ii) The hydraulic jump
 - (iii) Subcritical flow in an open channel
 - (iv) Flow of liquid through an expanding nozzle

3. Differentiate the following.

(6×5=30)

- (a) Gross Head and Net Head for Turbine
- (b) Francis Turbine and Kaplan Turbine
- (c) Low Head Power Plant and Medium Power Plant
- (d) Base Load Plant and Peak Load Plant
- (e) Homogeneous and Rock filled embankment dam
- (f) Firm Power and Secondary Power