B Tech III Semester Back Paper Examination - 2016
TCE705-HYDRAULIC STRUCTURE

M.M. 100 Time 3 Hrs

Note: Attempt all questions. Each question is of 20 marks.

Q.1 Attempt any 4 parts, each part is of 5 marks
A. What are the functions of Distributary head regulator and Cross-regulator? Explain with the help of neat sketches and differentiate between the two.
B. What are different types of hydraulic structures constructed to regulate a canal?
C. What is cistern element in a fall? Give various expressions for design.
D. Explain the functions and different types of canal escapes and canal bed bars with the help of neat sketch.
E. Write short notes on –
   (i) Silt extractor and silt ejector (ii) Divide wall (iii) Fish ladder (iv) Under sluices

Q.2 Attempt any 4 parts, each part is of 5 marks
A. Discuss with illustration the physical factors that govern the selection of type of dam.
B. Explain the following types of earth dam -
   (i) Rolled fill dam (ii) Hydraulic fill dam
   (iii) Zoned embankment type (iv) Diaphragm embankment type
C. What are the criteria for safe design of earth dam?
D. Explain the method of plotting phreatic line for an earth dam.
   i) With an horizontal filter at downstream ii) Without filter
   Also derive the equation for the phreatic line for an earth dam.
E. What are the different techniques for the construction of earth dam?

Q.3 Attempt any 2 parts, each part is of 10 marks
A. Discuss in brief various modes of failure of gravity dam. Explain the method of determining principal and shear stress in a gravity dam.
B. Explain the following in case of gravity dam –
   i) Galleries and shafts and necessity of these ii) Various types of structural joints
   iii) Various types of keys and water seals iv) Controlling of cracks
   v) Treatment of foundation
C. A 20 m high concrete dam having trapezoidal section has top width 2 m and bottom width 16 m. The b face of the dam exposed to water has a better of 1:10 on the reservoir side water stands upto the top.
   Assume the weight of concrete = 23.54 KN/m³. Coefficient of friction = 0.75, and allowable shear stress = 490.5 KN/m², and taking into account only the weight of the dam, water pressure and up lift pressure, calculate the factor of safety against overturning against sliding and shear friction factor.
Q.4 Attempt any 2 parts, each part is of 10 marks
A. Explain the functions of different components of a Spillway? Describe briefly the different types of Spillways for different site conditions and other requirements.
B. Describe various types of energy dissipation devices used below Spillway in relation to relative position of tail water rating curve and jump height rating curve.
C. An ogee type spillway has 2.5 m head above crest. Depth of flow at the toe of the spillway is 0.60 m. Assume C (in the equations \( Q = CH^{3/2} \)) as 2.16 \( m^{1/2}/S \), compute –
   (i) The discharge per meter length of spillway
   (ii) Pre jump velocity at the toe
   (iii) Pre jump Froude number of the flow
   (iv) Conjugate depth required for hydraulic jump

Q.5 Attempt any 2 parts, each part is of 10 marks
A. The load on a hydel plant varies from a minimum of 10,000 kW, to a maximum of 35,000 kW. Two turbo-generators of capacities 22,000 kW each have been installed.
   (i) Calculate: - (i) Total installed capacity of the plant (ii) plant factor
   (iii) maximum demand (iv) load factor (v) utilization factor.
B. Explain Mitra’s method of hyperbolic transition, derive the equation you use.
C. Using Chaturvedi’s formula, design and sketch for the following data –
   (a) Contraction transition
   (b) Expression transition
   Original canal width (BO) = 25m
   Flumed canal width (Bf) = 12.5m
   Total length of transition = 12m

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