Roll No.										

(9)

B.E (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2011

COMMON TO CIVIL / AGRICULTURAL AND IRRIGATION ENGINEERING

FOURH SEMESTER

CE 9253 APPLIED HYDRAULICS ENGINEERING

(REGULATIONS 2008)

Time: 3 hrs **Total Marks: 100**

Part A (10 x 2 = 20)

Answer All Questions

1. What are the potential advantages in using best hydraulic section?
2. What is Specific Force in Open Channel Hydraulics?
3. Define hydraulic jump and what are the applications of hydraulic jump?
4. Distinguish water surface profile determination by graphical method & standard step method?
5. What do you mean by specific speed of a turbine?
6. What is meant by NPSH for pumps?
7. What do you mean by 'Priming' of a pump?
8. State the conditions under which 'Cavitation' and 'negative slip' occur in pump.
9. Why a reciprocating pump is called positive displacement pump?
10. What are the different efficiencies of the pump?

Part B (5 x 16 = 80)
(Question 11 is compulsory)

11(i) Explain the types of flow in open channels. **(6)**

(ii) An irrigation channel of trapezoidal section, having side slopes 3 horizontal to 2 vertical, is to carry a flow of 10 cumec on a longitudinal slope of 1 in 5000. The channel is to be lined for which the value of friction coefficient in Manning's formula n = 0.012. Find the dimensions of the most economic section of the channel. **(10)**

12(a)

(i) State the assumptions and derive the basic differential equation of gradually varied flow. **(8)**

(ii) A rectangular flume 2 m wide carries a discharge of 2 m^3/sec. The bed slop of the flume is 0.0004. At a certain section the depth of flow is 1.0 m. Calculate the distance of the section downstream where the depth of flow is 0.9 m. Solve by single step method. Take 'n' as 0.014. Is the slope of the channel mild or steep? How is this type of surface profile classified? **(8)**

OR

12 (b)

(i) Explain the classification of channel bottom slopes and surface water profiles. **(6)**

(ii) A trapezoidal channel has a bottom wide of 6 m and side slope of 2 horizontal : 1 Vertical. If the depth of flow is 1.2 m at a discharge of 10 m^3/sec, compute the specific energy and the critical depth. **(10)**

13(a)

(i) State the assumptions and show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as $(y_2 - y_1)^3 / 4\, y_1\, y_2$. **(8)**

(ii) A 3 m wide rectangular channel has a flow of 3.6 m^3/sec with a velocity of 0.8 m/s. If a sudden release of additional flow at the upstream end of the channel causes the depth to rise by 50 %; determine the absolute velocity of the resulting surge and the new flow rate. **(8)**

OR

13(b)

(i) Derive the expression to determine the surge wave velocity (V_w) for positive surge moving downstream. **(8)**

(ii) A spillway discharges a flood flow at a rate of 7.75 m^3/sec per meter width. At the downstream horizontal apron the depth of flow was found to be 0.5 m. What tail water depth is needed to form a hydraulic jump? If jump is formed, find it type, length, head loss and energy loss as a % of the initial energy. **(8)**

14(a)

(i) Explain with neat sketch the working of a single-stage centrifugal pump? **(8)**

(ii) A pipeline of 1400 m long supplies water to 2 single jet Pelton wheels. The head above the nozzle is 360 m. The velocity coefficient for the nozzle is 0.98 and the coefficient of friction for the pipe is 0.03. The turbine efficiency based on the head at the nozzle is 0.85. The specific speed of each turbine is 15.3 and head lost due to friction in the pipeline is 12 m of water. If the operating speed of each turbine is 500 r.p.m, determine
(i) the total power required (ii) the diameter of each nozzle
(iii) volume/sec of water used (iv) the diameter of the pipeline **(8)**

OR

14(b)

(i) How turbines are classified based on several considerations? **(6)**

(ii)The quantity of water available for a hydraulic station is 275 m^3/sec under a head of 18 m. Assuming the speed of the turbines to be 150 r.pm. and their efficiency 82% determine the least number of machines, all of the same size, that will be needed if
(i) Francis turbines whose N_s must not exceed 395,
(ii)Kaplan turbines whose N_s must not exceed 690, are chosen.
What would be the individual output of units in the two cases? **(10)**

15(a)

(i) Explain the working principles of reciprocating pump with neat sketch? **(8)**

(ii) A single acting reciprocating pump has piston of diameter 150 mm and stroke of length 250 mm. The piston makes 50 double strokes per minute. The suction and delivery heads are 5 m and 15 m respectively. Find (i) discharge capacity of the pump in lit/min;
(ii) Force required to work the piston during the suction and delivery strokes if the efficiency of suction and delivery strokes are 60 % and 75 % respectively; and
(iii) Power required to operate the pump. **(8)**

OR

15(b)

(i) Explain the functions of air vessels in a Reciprocating pump? **(8)**

(ii) A double acting reciprocating pump has piston of diameter 250 mm and piston rod of diameter 50 mm which is on one side only. Length of piston strike is 350 mm and speed of crank moving the piston is 60 r.p.m. The suction and delivery heads are 4.5 m and 18 m respective. Determine the discharge capacity of the pump and the power required to operate the pump? **(8)**