

B.Tech. 4th Semester (Civil) F-Scheme Examination,
May-2018

FLUID MECHANICS-II

Paper-CE-204-F

Time allowed : 3 hours] [Maximum marks : 100

Note : (i) Question No. 1 is compulsory. Attempt one question from each section.

(ii) All questions carry equal marks.

(iii) Assume missing data, if any, suitably.

1. Explain the following : 5×4=20

- (i) HGL and TEL
- (ii) Brink depth analysis
- (iii) Reaction turbines
- (iv) Priming and maintenance in pumps
- (v) Branching of pipes.

Section-A

2. A 250 mm diameter, 3 km long straight pipe runs between two reservoirs of surface elevations 135 m and 60 m. A 1.5 km long, 300 mm diameter pipe is laid parallel to the 250 mm diameter pipe from its mid point to the lower reservoir. Neglecting all minor losses and assuming a friction factor of 0.002 for both pipes. Find

the increase in discharge caused by addition of 300 mm diameter pipe.

Also, explain the concept of equivalent length of pipe.

12+8=20

3. (a) Obtain a formula for the rise in pressure in a thin plastic pipe of circular section in which the flow of water is stopped by sudden closure of a valve.
- (b) Derive formulae for calculating loss of head due to (i) sudden enlargement, (ii) Sudden contraction.

10+10=20

Section-B

4. (a) State and prove the condition under which the trapezoidal section of an open channel will be most economical.
- (b) Derive the equation of gradually varied flow with assumptions.
- 10+10=20
5. (a) In a rectangular channel of width 24 m and depth of flow 6 m, the rate of flow of water is $86.4 \text{ m}^3/\text{s}$. If the bed slope of the channel is 1 in 4000, find the slope of the free water surface. Take $C = 60$.

- (b) What do you mean by critical depth of an open channel when the flow in it is not uniform ?

10+10=20

Section-C

6. (a) A pelton wheel is working under a head of 40 m and the discharge is $0.8 \text{ m}^3/\text{s}$. The mean bucket speed is 14 m/s. Find the overall efficiency and the power produced if the jet is deflected by the blades through an angle of 165° . Assume the coefficient of velocity = 0.985 and mechanical efficiency is 90%.
- (b) What is cavitation ? How it can be avoided in reaction turbine ?
- 12+8=20
7. Give the range of specific speed values of the Kaplan, Francis turbines and Pelton turbines. What factors decide whether Kaplan, Francis or a Pelton turbine would be used in a hydroelectric project ?
- 20

Section-D

8. (a) A single acting reciprocating pump, running at 50 r.p.m., delivers $0.01 \text{ m}^3/\text{s}$ of water. The diameter of the piston is 200 mm and stroke length

400 mm; determine the theoretical discharge of the pump, coefficient of discharge and slip and % of slip of the pump.

(b) What is slip of reciprocating pump ? $15+5=20$

9. (a) What do you mean by the pump characteristics ? Briefly explain the uses of such characteristics.

(b) Find the number of pumps required to take water from a deep well under a total head of 89 m. All the pumps are identical and are running at 800 r.p.m. the specific speed of each pump is given as 25 while the related capacity of each pump is $0.16 \text{ m}^3/\text{s}$. $10+10=20$