B.E. (Civil Engineering) Sixth Semester (C.B.S.)

Fluid Mechanics - II

P. Pages : 2 **NRJ/KW/17/4516**

Time : Three Hours * 0 1 1 5 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Define Boundary layer and Summarized the characteristics of a boundary layer. **7**

b) Calculate the diameter of a parachute to be use for dropping on object weighing 980 N so that the maximum terminal velocity of dropping is 5 m/sec. The drag coefficient for the parachute which may be treated as hemispherical is 1.3. The density of air is 1.22 kg/m^3. **7**

OR

2. a) Explain. **8**
i) Drag and lift force. ii) Displacement thickness, & Energy thickness.

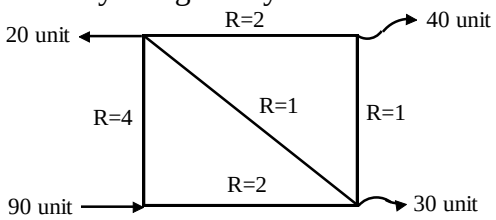
b) State the expression and sketch the velocity distribution across the section of a pipe carrying viscous fluid flow. **6**

3. Three reservoirs are connected by pipes 1,2 and 3. The free surface level in reservoirs A,B and C are 126.0m, 109.0m and 100.0m respectively. Calculate the rate of flow in each pipe assuming f = 0.02 pipe details are given below: **13**

Pipe	Diameter (m)	Length (m)	Connectivity
1	0.20	350	AD
2	0.15	250	BD
3	0.10	200	CD

OR

4. Analyse the given pipe network by using Hardy- Cross method. Do at least two iterations. **13**



5. a) Define most economical channel section of an open channel. What are the conditions to be satisfied for most economical trapezoidal and triangular sections? **6**

b) Find the slope of bed of rectangular channel of width 5m when depth of water is 2m and rate of flow is given as 20m^3/s. Take Chezy's constant C = 50. **7**

OR

6. a) A rectangular channel section having base width of 2m and depth of flow 1.5m with bed slope of 1/2000 is to be converted into most economical channel section with side slope of 1:1.5 80 as to carry same discharge with same longitudinal slope. Determine the dimensions of trapezoidal section. Take Manning's constant n = 0.016. **7**

b) Determine the expression too most economical trapezoidal channel. **6**

7. a) Find the slope of free water surface in a rectangular channel of width 20m having depth of flow 6m. The discharge through channel is 600 m^3/s Bed slope is 1 in 1000 and c = 60. **6**

b) A 3m wide rectangular channel carries 12 m^3/s of water at depth of 2m. Calculate. **7**

i) Specific energy at a given depth ii) Critical depth
iii) Critical velocity iv) Minimum specific energy

OR

8. a) Define hydraulic jump. Derive the expression of sequent depth in hydraulic jump. **6**

b) A rectangular channel has to carry discharge of 12 m^3/s a velocity of 7 m/s. Determine **7**

i) Whether hydraulic jump will occure & Not
ii) Depth before and after jump
iii) head loss in jump
iv) Height of jump
v) Length of jump
vi) Power loss in jump if width of channel is 7m.

9. a) Differentiate between Reynolds model law & Froude model law. Explain their scale ratios. **7**

b) In 1:40 model of spillway, the velocity and discharge are 1.6 m/s and 22 m^3/s. Find the corresponding velocity and discharge for prototype. **6**

OR

10. a) Explain Froude's method to model partially submerged bodies. **6**

b) Explain the different types of similarities. **7**

11. a) A single acting reciprocating pump has a plunger diameter of 100mm and a stroke of 200mm. The function pipe is 80mm in diameter and 6m long. The speed of the pump is 50rpm. Actual average discharge of pump is 0.03 cumec. Calculate the slip, the percentage slip and the theoretical power required to drive the pump. **7**

b) How the turbines are classified based on specific speed? Derive the expression for specific speed of a turbine. **7**

OR

12. a) Under a head of 200m at 500rpm, a turbine develops 550 kW of power. Determine its normal speed and output under a head of 120m. **7**

b) Draw the characteristic curves of a centrifugal pump with speed as an independent variable and discharge, power and head as dependent variables. **7**

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