ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE

B.E / B.TECH. DEGREE EXAMINATIONS : NOV / DEC 2010

REGULATIONS : 2008

THIRD SEMESTER – CIVIL ENGINEERING

080100015 - MECHANICS OF FLUIDS

Time : 3 Hours **Max. Marks : 100**

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Define Viscosity.
2. Define Cohesion and adhesion.
3. What is meant by control volume of liquid?.
4. What is compressibility of fluid.
5. What are the methods by which motion of a fluid is described?
6. Mention the few examples unsteady flow.
7. What is a stream line?
8. Define stream function.
9. What are the commonly used mechanical gauges?
10. State the types of equilibrium.
11. What is a flow net?
12. What are the assumptions made in Bernoulli's equation?
13. What is hydraulic mean depth or hydraulic radius?
14. What are eddies and venacontracta in pipe minor losses?
15. What is equivalent pipe?
16. State the characteristics of laminar flow.

17. What is boundary layer?
18. State the Bukingham – π Theorem
19. What is a model? When the model will yield useful information?
20. What is meant by scale effect?

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. (a). Calculate the work done in blowing a soap bubble of diameter 100 mm. Assume the surface tension of soap solution = 0.038 N/m. (4)

(b) Calculate the capillary effect in millimeters in a glass tube of 4 mm diameter, when immersed in (i) water (ii) mercury. The temperature of liquid is 20°C and the values of surface tension of water and mercury at 20°C in contact with air are 0.0735 N/m and 0.51 N/m respectively. The contact angle for water $\theta = 0°$ and for mercury $\theta = 130°$. Take specific weight of water at 20°C as equal to 9790 N/m^3. (8)

22.(a). The inlet to pump is 10.5 m above the two bottom of sump from which it draws water through a suction pipe. If the pressure at the pump inlet is not to fall below 28 KN/m^2 absolute. Work out the minimum depth of water in the tank. Assume atmospheric pressures as 100 kPa. (6)

22. (b). Find the equation for the stream line passing through (1,1) for the flow $v = y^2j-6xi$, determine the magnitude of velocity at A(x = 2 ; y = - 3 ; t = 2) for velocity vector v = (10t+xy) i + (- yx – 10 t) j + (- yx + x^2/2)k (6)

23.Oil of specific gravity 0.82 is pumped through a horizontal pipe line 150 mm in diameter and 3 Km long at the rate of 0.015 m^3/ sec . The pump has an efficiency of 68 % and require 7.5 KW to pump the oil. (i) what is the dynamic viscosity of the oil. (ii) Is the flow laminar?

24. Derive Euler's equation of motation and deduce Bernoulli's equation from it.

25. Water is to be supplied to the inhabitants of a college campus through a supply main. The following data is given.

Distance of reservoir from the campus = 3000 m

Number of inhabitants = 4000

Consumption of water per day of each habitant = 180 liters.

Loss of head due to friction = 18 m

Coefficient of friction for the pipe, f = 0.007

If the half of the daily supply is pumped in 8 hours, determine the size of the supply main.

26. The Performance of a spill way of an irrigation project is to be studied by means of model constructed to a scale of 1:9, neglecting the viscous and surface tension effects, determine :

(i) Rate of flow in model for a prototype discharge of 1200 m^3/ sec.

(ii) The dissipation energy in the two prototype hydraulic jump if the pump in the model dissipates 0.25 KW.

27. (a). Explain the Buckingham's π theorem method of dimensional analysis. (8)

(b). What are the merits and demerits of distorted models (4)

28. A trapezoidal 2 m wide at the bottom and 1 m deep has side slopes 1:1. Determine

(i) Total pressure;

(ii) Centre of pressure on the vertical gate closing the channel when it is full of water.

*****THE END*****