April 2019

Time – Three hours
(Maximum Marks: 75)

[N.B:(1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory.
Answer any FOUR questions from the remaining in each PART – A
and PART – B

(2) Answer division (a) or division (b) of each question in PART – C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B
and 10 marks in PART – C.]

PART – A

1. Derive the relationship between density and specific weight.

2. What is atmospheric pressure? Give its constant value.

3. How do you classify a flow as laminar?

4. When the power transmitted through the pipes will be maximum?

5. Why priming of a centrifugal pump is done?

6. What is specific energy?

7. How yield of wells can be estimated?

8. In what way a V-notch is superior?

PART – B

9. Explain the working of simple U-tube manometer.

10. What is vena-contracta? What makes it significant?

11. How will you estimate the head loss of flowing fluid due to friction?

12. What are the effects of end contractions in a weir? When will you
account for it?

13. What is velocity of approach? How will it affect the discharge over
the weir?

14. Derive the relationship between Chezy's constant 'C' and Mannings
constant 'N'.

15. Under what conditions a circular channel section will provide
maximum discharge?

16. What is the slip of a reciprocating pump? When it will become
negative?

        [Turn over ...

PART - C

17. (a) The pressure at a point in a pipe line carrying a fluid of specific gravity 0.9 is measured by a U-tube manometer containing mercury. The centre of the pipe is 120mm below the level of mercury in the open right limb. The difference in mercury level between the limbs is 200mm. What will be the pressure of fluid in the pipeline? Express this pressure in absolute head of mercury.

(Or)

    (b) A circular plate 3 metres diameter is submerged in water such that its greatest and least depths below the free surface of water are 2 metre and 1 metre respectively. Find (i)The total pressure on the plate and (ii)The position of centre of pressure.

18. (a) A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 litres/s. Find the reading of the oil – mercury differential manometer. Take $C_d = 0.98$.

(Or)

    (b) The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200mm is suddenly enlarged to 400mm. The pressure intensity in the smaller pipe is 11.772×10^4 N/m^2. Determine (i)Loss of head due to sudden enlargement (ii)Pressure intensity in the larger pipe.

19. (a) Derive the discharge equation for a V-notch.

(Or)

    (b) Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking C_c for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth over the triangular weir.

20. (a) Find the bed slope of trapezoidal channel of bed width 6m, depth of water 3m and side slope of 3 horizontal to 4 vertical, when the discharge through the channel is 30 m^3/s. Take Chezy's constant C=70.

(Or)

    (b) A rectangular channel carries water at the rate of 400 litres/s, when bed slope is 1 in 2000. Find the most economical dimensions of the channel, if C=50.

21. (a) The cylinder diameter of a single acting reciprocating pump is 150mm and its stroke is 300mm. The pump runs at 50 rpm and lifts water through a height of 25m. The delivery pipe is 22m long and 100mm in diameter. Find the theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s, find the percentage slip and efficiency of the pump.

(Or)

    (b) Explain the construction detail and working of a centrifugal pump with a neat sketch.