

17421

16117

3 Hours / 100 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. a) **Attempt any SIX of the following:**

12

- (i) Define capillarity.
- (ii) If 5 m^3 of certain oil weighs 40kN calculate specific weight, mass density.
- (iii) What is the principle of manometer ?
- (iv) Express a pressure intensity of 5 kg (f)/cm^2 in metres of head of water and mercury.
- (v) What is Moody's diagram ? State its use.
- (vi) Draw a neat sketch showing flow through parallel pipes.
- (vii) State the principle of venturimeter.
- (viii) What is venna-contracta ?

b) **Attempt any TWO of the following:**

8

- (i) Draw a neat sketch showing various types of fluids according to Newton's law of viscosity.
- (ii) If $5 \text{ mm } \phi$ glass tube is immersed in water and contact angle is 5° , find capillary rise. Take surface tension for water as 0.074 N/m .

P.T.O.

(iii) State Pascal's Law of fluid pressure. Enlist any four applications of it.

2. Attempt any FOUR of the following: 16

- a) A rectangular plate is 2m wide and 3m deep. It lies in vertical plane in water. Find total pressure and position of C.P. on the plate when its upper edge is horizontal and -
- (i) coincides with water and
 - (ii) 2.5m below free water surface.
- b) A triangular plate having 1m base and 1.8m altitude is immersed in water. The plane of plate is inclined at 30° with free surface of water and base is parallel to and at a depth of 2m from water surface. Find pressure acting on the plate and its centre of pressure.
- c) Explain the concept and use of pressure diagram with neat sketches.
- d) An oil of specific gravity = 0.8 is flowing through a pipe. A simple manometer is connected to the pipe containing mercury. The deflection of mercury level in left limb from centre of pipe = 60mm where as in right limb (from centre of pipe) it is 90mm. Calculate the pressure in KPa.
- e) State Bernoulli's theorem. State any two applications of it.
- f) Define -
- (i) Pressure head
 - (ii) Velocity head with neat sketches.

3. Attempt any FOUR of the following: 16

- a) What are stream lines and equipotential lines. State any two uses of flow net.
- b) Water is flowing through tapering pipe whose centre of upper end is 5m above the datum and its diameter is 20cm. The pressure at this upper end is 5 kg/cm^2 . The lower end is situated 3m above the datum with a diameter of 05cm. Determine the pressure at lower end if velocity at upper end is 1m/s.

- c) Find head lost due to friction in a pipe of $\phi = 300$ mm and length = 50 m thro' which water is flowing at a velocity = 3 m/s using –
- (i) Darcy's equation
 - (ii) Chezy's formula
- Take $f = 0.00256$ and $C = 60$.
- d) What are major and minor loss of head in flow thro' pipes ? Write any two equations of minor loss.
- e) What is HGL and TEL ? Explain with a neat sketch.
- f) Define with a neat sketch for a trapezoidal channel –
- (i) Hydraulic Depth
 - (ii) Hydraulic Radius.

4. Attempt any FOUR of the following:

16

- a) The daily record of rainfall over a catchment is 0.2 million cubic meter. Out of this 80% rain water reaches the storage reservoir and passes over a rectangular weir. What should be its length if water level do not rise more than 400 mm above the crest. Take $C_d = 0.61$.
- b) What is meant by most economical channel section ? Explain with an example and sketch.
- c) Explain the phenomenon of hydraulic jump with a neat sketch. State any two uses of it.
- d) What is Froude's experiment ? Explain with a neat sketch.
- e) Define hydraulic coefficients. State the relationship among the hydraulic coefficients for an orifice.
- f) Explain with a neat sketch the working of venturimeter.

5. Attempt any FOUR of the following:**16**

- a) Draw a neat sketch of cup type current meter and explain its working.
- b) A rectangular notch 2.5m wide has a constant head of 40cm. Find discharge over it if $C_d = 0.62$.
- c) Write any four advantages of triangular notch over rectangular notch.
- d) Define -
 - (i) Static head
 - (ii) Manometric head of pump
- e) Differentiate between centrifugal pump and reciprocating pump. (Any four points)
- f) A centrifugal pump delivers water at 30 lit/sec to a height of 18m thro' a pipe 90m long and 100mm in diameter. If overall efficiency of pump is 75% find power required to drive the pump. Take $f = 0.012$.

6. Attempt any TWO of the following:**16**

- a) Explain with a neat sketch the working of Bourdon's pressure gauge.
 - b) A syphon of $\phi = 200$ mm connects two reservoir having difference of elevation 20m. Total length of pipe is 500m and summit of syphon is 3.0m above water level of upper reservoir. The length of pipe from upper reservoir to summit is 100m. Find discharge and pressure at the summit. Neglect minor losses. Take $f = 0.005$.
 - c) A trapezoidal most economical channel section has side slopes 1.5 (H):1(V). It is required to discharge $20\text{m}^3/\text{sec}$ with a bed slope of 1m in 6.0 km. Design the section using Manning's formula. Take $N = 0.015$
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