11819

17426

3 Hours / 100 Marks Seat No. | | | | | | | | |

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 : **(2×6)**

a) Define "Partial Pressure" and "Vapour Pressure".

b) Name the types of fluids based upon variation of density with temperature, pressure.

c) Define "Critical velocity.

d) Write down the formulae to calculate the Fanning friction factor for laminar, turbulent flow.

e) Define "Schedule Number".

f) Name any two examples of positive displacement pump.

g) Write any two industrial applications of Fans.

B) Attempt **any two** of the following : **(4×2)**

a) A 75 mm diameter pipe discharges liquid at the rate of 30 l/s. Determine the type of flow, if the kinematic viscosity of liquid is 1.2×10^{-4} m^2/s. Density of the liquid is 1600 kg/m^3.

b) Draw a neat sketch of Gate valve. Write its one application.

c) Explain in brief :

i) Cavitation

ii) Net Positive Suction Head of a centrifugal pump.

2. Attempt **any four** of the following : **(4×4)**

a) Derive the expression to calculate pressure drop by U-tube manometer with suitable diagram.

Marks

b) Acetic acid flows through a 75 mm internal diameter pipe at a rate of 0.015 m^3/s. Calculate the pressure drop in the horizontal pipe of length 70 m.
Data : Viscosity of acid = 2.5 $mN.s/m^2$.
Density of acid = 1060 kg/m^3.

c) Explain the working of a Rupture disc with the help of a suitable diagram.

d) Explain the frictional losses in pipes due to sudden contraction. Also write the equation to calculate the frictional losses.

e) Describe the construction of an orifice meter.

f) Draw the characteristics curve of a centrifugal pump.

3. Attempt **any four** of the following : **(4×4)**

a) A simple U-tube manometer is installed across an orifice meter. The manometer is filled with mercury of the liquid above the mercury is carbon tetrachloride. The manometer reads 100 mm. Find the pressure difference over the manometer in N/m^2. Density of mercury = 13600 kg/m^3. Density of carbon tetrachloride = 1600 kg / m^3.

b) Name any four types of valves used in industry along with their specific use.

c) Differentiate between Reciprocating, centrifugal pump (4 points).

d) Draw a neat sketch of centrifugal pump and mark the parts.

e) State Newton's law of viscosity. Name the types of Non-Newtonian fluids along with suitable example.

f) A pump delivers water from a holding tank at atmospheric temperature (101.325 kPa) to a process equipment at 450 kPa at a flow rate of 6.2 l/s. The process equipment is located 10 m higher than the holding tank. Calculate the power requirement of the pump.

Data : Density of water = 995 kg/m^3
Efficiency of pump = 70%
Diameter of pipe = 20 cm.

4. Attempt **any four** of the following : **(4×4)**

a) Write the various types of pipe fittings with their specific use (any four).

b) Explain in brief the Reynolds experiment with its sketch.

c) Explain the working of reciprocating compressor.

d) Explain briefly the calibration of a given Rotameter.

e) A fluid is flowing through a 5 cm diameter pipe at a velocity of 2 m/s. Suddenly it enters into a pipe of diameter 10 cm. Calculate the frictional loss due to sudden expansion of the flow area.

f) Draw a neat sketch of a well mano-meter. Also explain its working.

Marks

5. Attempt **any two** of the following : **(8×2)**

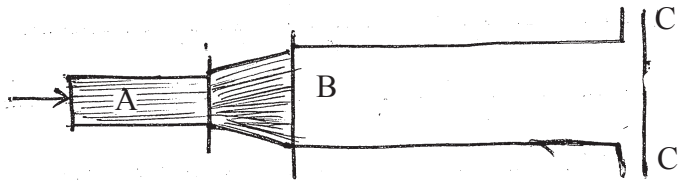
a) Derive the Hagen Poiseulle's equation

b) Water flows through the piping system shown in the following figure. An equal quantity of water flow through each of the pipes C. The flow through pipe A is 10 m^3/hr. Calculate.

i) Mass flow rate in each pipe

ii) Average velocity in each pipe

iii) Mass velocity in pipes A, B.



Pipe A = 50 mm I.D.

Pipe B = 75 mm I.D.

Pipe C = 40 mm I.D.

c) Derive the flow equation for a venturi meter.

6. Attempt **any two** of the following : **(8×2)**

a) With a neat sketch explain the working of a single acting reciprocating pump.

b) Derive the Bernoulli's equation. Also write the corrected equation for work done by pump.

c) Explain the principle, construction and working of a steam jet ejector with a suitable diagram.
