314310

24225

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer 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.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following: **10**

a) Define the terms Ideal fluid, Actual fluid.

b) Enlist any two dimensionless numbers.

c) Suggest the flow meters for measurement of flow rate of fluids in open channels. (Any two)

d) Define the terms cavitation and air binding.

e) List down any four pipe fittings.

f) Suggest any two gas pumping devices.

g) Write down the reason for provision of inter stage cooling during the compression of gases.

Marks

2. Attempt any THREE of the following: **12**

a) Define the terms –

i) Mass flow rate

ii) Critical velocity

iii) Form friction

iv) Potential flow.

b) State and device Newton's law of viscosity.

c) With the help of a neat suitable diagram, describe the construction of a venturimeter.

d) Explain the concept of fluidisation and write down the applications of fluidisation.

3. Attempt any THREE of the following: **12**

a) Draw a neat sketch of Reynold's experimental set up for determination of nature of flow of fluids.

b) A simple U-tube manometer is installed across an orifice meter. The manometer is filled with mercury and the liquid above mercury is carbon tetrachloride. The manometer reads 100 mm of Hg. Find the pressure difference over the manometer in N/m^2.

Data:

i) Density of mercury = 13600 kg/m^3.

ii) Density of carbon tetrachloride = 1600 kg/m^3.

c) Explain the significance of characteristic curves for centrifugal pump.

d) Differentiate between centrifugal, reciprocating compressor. (Any four points)

4. Attempt any THREE of the following: **12**

a) Write down the significance of Fanning equation. Also write down equations for calculating the Fanning friction factor for laminar, turbulent flow.

b) Explain the construction and working of pitot tube.

c) Draw a neat sketch of ball valve and write it's uses.

Marks

d) Explain the working of a steam jet ejector with a suitable diagram.

e) Draw a neat sketch of a rotameter, explain it's construction.

5. Attempt any TWO of the following: **12**

a) Describe the construction and working of Redwood viscometer with a neat diagram.

b) Calculate the pressure drop due to friction in a 300 m long pipe of 100 mm ID pipe through which water is flowing at a rate of 0.05 m^3/s.

Data –

i) Density of water = 1000 kg/m^3.

ii) Viscosity of water = 1.0×10^{-3} $N.S/m^2$.

c) A sharp edged circular orifice is to be used to measure the flow rate of water at 293 k in a pipeline of internal diameter of 250 mm. The orifice diameter is 125 mm. The reading of a mercury manometer is 242 mm. Calculate the flow rate of water in *l*/s.

Data –

i) Density of water = 1000 kg/m^3.

ii) Coefficient of orifice meter = 0.61.

6. Attempt any TWO of the following: **12**

a) State and derive Bernoulli's theorem.

b) Describe the principle construction and working of a single acting reciprocating pump.

c) A pump delivers water from a holding tank at atmospheric pressure (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 if the fluid friction and changes in kinetic energy are negligible.

Data –

i) Density of water = 995 kg/m^3.

ii) Efficiency of pump = 70%.