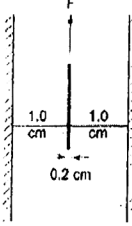


CO1 (20 Marks)		Marks
1.(a)	State the relation between dynamic viscosity and kinematic viscosity. What are the cgs and SI unit of kinematic viscosity? State relation between them.	1+2+1
(b)	<p>A 2.2 cm wide gap between two vertical plane surfaces is filled with an oil of specific gravity 0.85 and dynamic viscosity 20 poise. A metal plate 1.2 m x 1.2 m x 0.2 cm thick and weighting 45 N is placed midway in the gap. Find the force required, if the plate is to be lifted up with a constant velocity of 0.15 m/s.</p> 	10
(c)	Define co-efficient viscosity. In a shear stress vs shear strain diagram, show the nature of a Newtonian and different non-Newtonian fluids	2+4
CO2 (24 Marks)		
2 (a)	For the velocity field given by $\vec{V} = 10xy\hat{i} + 5x^2\hat{j} + (t^2x + z)\hat{k}$, find the velocity and acceleration of a fluid particle at $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k}$ when time $t=1$.	10
(b)	<p>A conical pipe diverges uniformly from 0.1 m diameter to 0.2 m diameter over a length of 1 m. Find the local and convective acceleration at the middle of the diffuser for (i) constant flow rate of 100 l/s and (ii) flow rate varies uniformly from 100 l/s to 200 l/s in 5 sec and the time of interest is 2 sec. Velocity at any cross section is uniform.</p> <p style="text-align: center;">OR</p> <p>With neat sketches, deduce the expression for Darcy-Weisbach equation, explaining each term.</p>	10
(c)	<p>What are the minor losses encountered in a pipe flow? How the minor losses are expressed mathematically?</p> <p style="text-align: center;">OR</p> <p>A right angled V-notch is employed to measure the discharge. Estimate the flow rate if the head $(H \pm dH)$ measured above the still is given as (0.2 ± 0.01) m. take $C_d = 0.60$</p>	4
CO3 (22 marks)		
3(a)	<p>Derive Chezy's equation for a uniform open channel flow.</p> <p style="text-align: center;">Or</p> <p>A 300m long pipe has a slope of 1:100 and tapers from 1m at high end to 0.5 m at low end. Water flow rate is 5400 liters/min and pressure at high end is 70 kPa. Find the pressure at the low end.</p>	8
(b)	<p>With a neat sketch of a venturimeter, deduce the expression of obtaining the flow rate of a fluid through a pipe.</p> <p style="text-align: center;">OR</p> <p>A horizontal venturimeter, 300 mm inlet and 100 mm throat, is used to measure the flow of water through a pipeline. Pressure in pipe is 1.5 bar and vacuum pressure at the throat is 40cm of Hg. Calculate the rate of flow. It may be presumed that 5% of the differential head is lost between pipe main and the throat section. Also calculate the discharge co-efficient. Take sp wt of water = 10 kN/m^3.</p>	10
(c)	When 'Mach Cone' is observed? With a diagram show the 'Mach Cone', Mach angle, Mach line, zone of silence and zone of action.	4

Ref. No. Ex/PE/PC/B/T/214/2023(S)

B.E. POWER ENGG. 2ND YEAR 1ST SEMESTAR SUPPLEMENTARY EXAM- 2023

SUBJECT: Fluid Mechanics

Time -3 hours

Full Marks 100

CO4 (14 marks)		
4 (a)	The efficiency η of a fan depends on density ρ , dynamic viscosity μ , angular velocity ω , Diameter D and discharge Q . Using Buckingham's Pi-theorem show that $\eta = f\left[\frac{\mu}{D^2 \omega \rho}, \frac{Q}{D^2 \omega}\right].$	10
(b)	What is similitude? What do you mean by dynamic similarity?	4
CO5 (20 marks)		
5 (a)	A centrifugal pump has overall efficiency 72%, deliver 0.03 m ³ /s of water to a height of 20 m through a 10 cm diameter pipe 80 m long. Calculate, power required to run the pump. Take friction co-efficient as $f=0.01$. neglect inlet and exit loss.	10
(b)	A jet of water is striking at the center of a flat plate with a velocity ' V ' while the plate is moving with velocity ' u ' in the direction of jet. With the help of a neat sketch, determine the maximum efficiency of the vane. What will be the maximum efficiency (jet striking at center) for series of plates mounted on a wheel? OR With a neat sketch of velocity vector diagram of a centrifugal impeller, deduce the expression of Euler Head.	10