QP Code: RN23BTECH057 | Reg. No | | | | | | | | | | | AY 23

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (Third Semester - Regular) Examinations, November – 2024

23BCHPC23002– Fluid Mechanics

(Chemical Engg.)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Determine the intensity of shear of an oil having viscosity= 1poise. The oil is used for lubricating the clearance between a shaft of diameter 10cm & its bearing. The thickness of the clearance is 1.5mm & the shaft rotates at 150 rpm.	CO1	K3
b.	Enumerate different types of fluid with its examples of each.	CO1	K1
c.	Differentiate between pipe and tube.	CO4	K2
d.	Define Terminal Velocity.	CO3	K4
e.	Write the limitations of the Bernoulli's equation.	CO2	K1

PART – B **(10 x 5 = 50 Marks)**

		Marks	CO #	Blooms Level
	Answer ***ALL*** the questions			
2. a.	Prove that pressure increases with the depth of fluid.	5	CO1	K2
b.	The space between two square flat parallel plates is filled with oil, each side of the plate having 60cm. The thickness of the oil film is 12mm. The upper plate which moves at 3m/s require a force of 98.1N to maintain the speed. Determine (i) Dynamic viscosity of oil in poise. (ii) Kinematic viscosity of the oil in stokes if the specific gravity of oil is 0.95.	5	CO1	K3
	(OR)			
c.	Explain Boundary layer formation over a flat tube with neat labelled diagram	5	CO2	K4
d.	A differential manometer is connected at the two points A & B. The pipe A contains a liquid of sp.gr=1.5, while B contains a liquid of sp.gr=0.9. The pressure at A & B are 1kgf/cm^2 & 1.80 kgf/cm^2. Find the difference in mercury level in the differential manometer.	5	CO2	K3
3.a.	A pipeline carrying oil of specific gravity 0.9, changes in diameter from 200mm diameter at a position A to 500mm diameter at a position B, which is 4m at a higher level. If the pressure at A and B are 9.81 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 lit/sec. Determine the loss of head and direction of flow.	3	CO3	K3
b.	Derive Bernoulli's theorem.	7	CO3	K2
	(OR)			
c.	Water flow through a 150 mm diameter orifice inserted in a 300 mm diameter pipe. If the pressure gauges fitted upstream and downstream of the orifice plate and have the readings 176.58 KN/m^2 and 88.29 KN/m^2 respectively. Find the discharge if Cd = 0.6.	5	CO3	K3

d.	Water flows a pipe of AB 1.2m diameter at 3 m/s and then passes through a pipe BC 1.5m diameter. At C, the pipe branches. Branch CD is 0.8m in diameter and carries 1/3rd of the flow in AB. The flow velocity in branch CE is 2.5 m/s, find the volume flow rate in AB, the velocity in BC, the velocity in CD and the diameter of CE.	5	CO3	K3
4.a.	Define Fanning Friction Factor.	2	CO4	K1
b.	Derive the expression for laminar flow of fluid in pipe and prove that average velocity is half of maximum velocity.	8	CO4	K4
	(OR)			
c.	Briefly describe the basic equations of compressible fluid.	5	CO4	K1
d.	Derive Hagen Poiuilles equation.	5	CO4	K2
5.a.	A flat plate 1.5*1.5 moves at 50km/hr in stationary air of density 1.15kg/m^3. If the coefficient of drag & lift is 0.15 & 0.75 respectively. Determine (i) The lift force (ii) The drag force (iii) The resultant force (iv) Power required to keep the plate in motion (where P= F_D*U/1000)	3	CO3	K3
b.	A kite 0.8 × 0.8m weighing 0.4kgf (3.924 N) assume as angle of 12° to the horizontal. The string attached to the kite makes an angle of 45° to the horizontal. The pull on the string is 2.5kgf (24.525 N) when the wind is flowing at a speed of 30km/hr, find the corresponding of drag and lift. Density of air is 1.25 kg/m^3.	7	CO3	K4
	(OR)			
c.	Summarise the concept of streamlined body and bluff body.	2	CO3	K2
d.	The pressure difference in a pipe of diameter, length, due to turbulent flow depends upon the velocity, viscosity, density and roughness. Using Buckingham's π- theorem obtain an expression for the pressure difference.	8	CO3	K3
6.a.	Define priming.	2	CO5	K2
b.	Explain in details about the types of valves with its advantages & disadvantages.	8	CO5	K3
	(OR)			
c.	Define cavitation & explain how can it be prevented?	3	CO5	K1
d.	Explain the construction and working principle of Centrifugal pump with neat sketch.	7	CO5	K3

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