QP Code: RD21BTECH049 | Reg. No | | | | | | | | | | | AR 21

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

21BCHPC23002 – Fluid Mechanics

(Chemical Engineering)

Time: 3 hrs | Maximum: 70 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. 2 litre of crude oil weighs 19.2N. Calculate specific weight, density and specific gravity.	CO1	K1
b. Diffentiate uniform and non-uniform flow of fluid.	CO2	K1
c. What is the relationship between the drag coefficient and Reynolds number in the Stoke's law range (Reynolds number < 1)?	CO3	K2
d. How are the repeating variables selected for dimensional analysis?	CO3	K2
e. Define slip.	CO4	K1

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. A vertical cylinder of diameter 15cm rotates concentrically inside another cylinder of diameter 15.1cm. Both the cylinders are 25cm high. The space between the cylinders is filled with a liquid. Determine the viscosity of the liquid if a torque of 12Nm is required to rotate the inner cylinder at 100rpm.	8	CO1	K1
b. A Differential manometer is connected at the points A and B at the centre of two pipes. The pipe A (left limb) contains a liquid of specific gravity 1.5 while pipe B (right limb) contains a liquid of specific gravity 0.9. The pressure at A and B are 1 kgf/cm^2 and 1.8kgf/cm^2 respectively. Find the difference in level of mercury in the differential manometer, if point A is 3m above B and 5m above the mercury in its own limb. B is 2 m above the mercury level in limb A.	7	CO1	K1
(OR)			
c. Two plates are placed at a distance of 0.15mm apart. The lower plate is fixed while the upper plate having surface area 1m^2 is pulled at 0.3m/s. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity 1.5poise.	8	CO1	K1
d. Derive Pascal's law.	7	CO1	K1
3.a. Water is flowing through a taper pipe of length 40m having diameters 45cm at upper end and 30cm at lower end, at the rate of 75lps. The pipe has a slope of 1 in 20. Find the pressure at lower end if pressure at higher end is 26N/cm^2.	8	CO2	K2
b. Explain in details about pressure drag and friction drag on a submerged body.	7	CO3	K2
(OR)			
c. A kite weighing 7.848N has an effective area of 0.8m^2. It is maintained in air at an angle of 10^0 to the horizontal. The string attached to the kite makes an angle of 45^0 to the horizontal and at this position the value of co-efficient of drag and lift are 0.6 and 0.8 respectively. Find the speed of the wind and the tension in the	8	CO3	K2

string. Take the density of air as 1.25kg/m^3.

d.	Water flows through a pipe AB 2.8 m diameter at 4m/s and then passes through a pipe BC 2m diameter. At C, the pipe branches. Branch CD is 1.2m diameter and carries one-third of flow in AB. The flow velocity in branch CE is 3m/s. Find the volumetric flow rate of AB, velocity in CD and diameter of CE.	7	CO2	K2
4.a.	The variables controlling the motion of a floating vessel through water are the drag force F, speed v, length l, density and dynamic viscosity of water and acceleration due to gravity g. Derive an expression for F by dimensional analysis.	10	CO3	K3
b.	Describe the mechanism of fluidization.	5	CO4	K2
	(OR)			
c.	Derive the boundary layer formation of fluid in a flat plate with neat sketch.	5	CO2	K1
d.	A horizontal venturimeter with inlet diameter 30cm and throat diameter 15cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 50lps. Find the reading of oil–mercury differential manometer.	10	CO2	K2
5.a.	Explain the construction and working principle of rotameter with neat sketch.	8	CO4	K2
b.	Write the working of centrifugal pump with neat sketch.	7	CO4	K2
	(OR)			
c.	Differentiate between pump and compressor.	8	CO4	K2
d.	Explain in details about the types of fittings.	7	CO4	K2

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