SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University)
Coimbatore – 641 035.

Reg. No. : | | | | | | | |

B.E DEGREE MODEL EXAMINATION, NOV/DEC 2021
III SEMESTER
BE- AGRICULTURE ENGINEERING
19MEB201 – FLUID MECHANICS & MACHINERY
(REGULATION 2019)

TIME: THREE HOURS **MAXIMUM MARKS: 100**

ANSWER ALL QUESTIONS

PART A — (10 x 2 = 20 Marks)

		CO	BL	
1.	State Newton's Law of Viscosity	CO1	R	2
2.	What are Non-Newtonian fluids? Give examples.	CO1	U	2
3.	State Buckingham's π theorem.	CO2	R	2
4.	Give two examples of a fluid flow situation where Froude model law in applied.	CO2	APP	2
5.	Define boundary layer and give its significance.	CO3	U	2
6.	List the causes of minor energy losses in flow through pipes.	CO3	U	2
7.	Classify turbines according to flow.	CO4	APP	2
8.	Define hydraulic efficiency of a turbine.	CO4	U	2
9.	What is the role of volute chamber of a centrifugal pump?	CO5	U	2
10.	When do negative slip occur?	CO5	R	2

PART B — (5 x 13 = 65 Marks)

11.	(a)	(i)	Determine Mass density and Specific volume of liquid whose relative density is 0.85	CO1	AN	6
		(ii)	Explain Types of flow with examples		U	7
			(OR)			
	(b)	(i)	Derive Euler's equation of motion for flow along a stream line. What are the assumptions involved.	CO1	R	10
		(ii)	State Pasca's hydrostatic law.	CO1	R	3

12.	**(a)**		**Derive Euler's equation of motion for flow along a stream line. What are the assumptions involved.**	**CO2**	**R**	**13**
			(OR)			
	(b)	**(i)**	**Explain the properties of a hydraulic fluid.**	**CO2**	**R**	**8**
		(ii)	**Define Reynolds number and Mach number**	**CO2**	**U**	**5**
13.	**(a)**		**Three pipes of 400 mm, 350 mm and 300 mm diameter are connected in series between two reservoirs.** **With a difference in level of 12 m. Friction factor is 0.024, 0.021 and 0.019 respectively. The lengths are 200 m, 300 m and 250 m. Determine flow rate neglecting minor losses**	**CO3**	**AP**	**13**
			(OR)			
	(b)		**Derive Darcys Weisbach equation for calculating loss of head due to friction in pipes.**	**CO3**	**R**	**13**
14.	**(a)**		**A Kaplan turbine working under a head of 20 m develops 15 MW brake power. The hub diameter and runner diameter of the turbine are 1.5 m and 4 m respectively. The guide blade angle at the inlet is 30°.ηn =0.9 and ηo= 0.8. The discharge is radial. Find the runner vane angles and turbine speed**	**CO4**	**AP**	**13**
			(OR)			
	(b)		**A Francis turbine with an overall efficiency of 76% and hydraulic efficiency of 80% is required to produce 150 kW. It is working under a head of 8 m. The peripheral velocity is 0.25 $\sqrt{2gH}$ and radial39 velocity of flow at inlet is 0.95 $\sqrt{2gH}$. The wheel runs at 150 rpm. Assuming radial discharge, determine** **(i) Flow velocity at outlet** **(ii) The wheel angle at inlet** **(iii) Diameter and width of the wheel at inlet**	**CO4**	**AP**	**13**
15.	**(a)**		**Explain the working principle of reciprocating pump with neat sketch**	**CO5**	**R**	**13**
			(OR)			
	(b)		**Explain the working principle of Centrifugal pump with neat sketch**	**CO5**	**R**	**13**

PART C — (1 x 15 = 15 Marks)

16.	**(a)**		**A centrifugal pump delivers water at 0.075m3/s with a head of 20 m while operating at 880 rpm. The hub-to-shroud radius ratio at the inlet is 0.35 and the relative velocity makes an angle of-b2" at the inlet, (i) Find the reversible work done by the pump, (ii) What is the work done by the impeller ? (iii) Find the impeller radius and the inlet radius of the shroud, (iv) Determine the blade width at the exit of the impeller, (v) Assume a reasonable number of blades, and calculate the blade angle at the exit. Use the Pfleiderer equation to determine more accurately the number of blades and recalculate the blade angle at the exit if needed, (vi) what is the power required to drive the pump ?**	**CO4**	**C**	**15**
			(OR)			
	(b)		**The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively The rate of flow through pipe is 35 litres / second. The section 1 is 6 meter above the datum line and section 2 is 4 meter above datum. If the pressure at section 1 is 39.24 N / cm 2 , find the intensity of pressure at section 2.**	**CO1**	**A**	**15**

Blooms Taxonomy Abbreviations: R-Remembrance, U-Understanding, APP- Apply, AN-Analyze, E-Evaluate, C-Create

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