

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), **NOV.** – 2017

B. Tech in Mechanical Engineering, Semester III

Roll No.....

ME 308: Fluid Mechanics and Machinery

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Clarity & approach is needed to score full marks.
5. Don't disturb any invigilator in case of doubt. Use your commonsense.

Q.1A	(10 questions @ 1 mark)	10
i.	What is viscosity?	
ii.	What is the significance and use of specific gravity?	
iii.	Explain piezometric head.	
iv.	Why are the walls of a dam thicker at base?	
v.	What is a control surface?	
vi.	What is pascal's law?	
vii.	What is a streak-line and what is its use?	
viii.	What is flow net?	
ix.	What is laminar sub layer?	
x.	What is Reynolds stress?	
Q.2	Attempt any two.	
i.	How does a floating ship maintain its stability in a sea storm?	5
ii.	How would you make a pump function if there is no fluid in its suction pipe?	5
iii.	Recently a plane carrying NBA players got damaged at its nose mid-air. What could be the possible causes, considering that there was no structural damage before takeoff and also there was no external impact mid-air?	5
Q.3A	Derive the continuity equation in differential form . Mention all the details which you have taken to arrive at the final equation.	07
Q.3B	What is newton's law of viscosity?	03
Q.4A	An oil of specific gravity 0.9 is contained in a vessel. At a point the height of the oil 40m. Find the corresponding height of the water at that point.	04
Q.4B	At 20°C, two parallel plates are taken at a 5mm distance between them. Plates are positioned horizontally. The 5mm distance between them is filled with oil having viscosity 0.44 Pa-s and density 888kg/m ³ . How much shear stress is required to move the upper plate at 5m/s?	06

Q.5A	A 4mm tank of uniform x-section is completely filled with water and oil (SG = 0.9) in equal volumes. Determine the pressure at the interface of two fluids and at the bottom of the tank. Determine the pressure profile along the depth. $P_{atm} = 101.325 \text{ kPa}$.	06
Q.5B	What are the advantages and limitations of manometers?	04
Q.6A	A test tube of 60 cm height is filled with Hg and is placed inverted in a tank of Hg filled upto 20cm. local atmospheric pressure is 100kPa. Determine the inside pressure at middle and top end of test tube.	05
Q.6B	A pipe (of continuously varying x-section) through which water is flowing, is having diameters 20 cm(entry) and 10 cm(exit) respectively at its ends. The velocity of water at entry is 4.0 m/s. find velocity head at entry and exit. Also, find flow rate.	05
	OR	
Q.6B	Explain the function of draft tube and its types.	05
Q.7A	How are turbines classified under various criterion?	05
Q.7B	What is NPSH w.r.t. to Pumps?	05
	OR	
Q.7B	What is slip? Explain it in detail w.r.t. reciprocating pumps.	05
Q.8A	Find the expression of efficiency of power transmission through pipes.	10
Q.9A	A fluid flow is given by $V = x^2y\hat{i} + y^2z\hat{j} - (2xyz + yz^2)\hat{k}$ Prove that it's a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the point (2, 1, 3).	10
Q.9B	Find the expression, under actual conditions using differential manometer, to measure flow rate using a venturimeter.	10
	OR	
Q.9B	Laminar flow is taking place in a pipe of diameter 200mm. the maximum velocity is 1.5 m/s. find the mean velocity and the radius at which this occurs. Also, calculate the velocity at 4 cm from the wall of the pipe.	10