

INDIAN MARITIME UNIVERSITY
(A Central University, Govt. of India)

May/June 2015 End Semester Examinations

SEMESTER – IV, B.TECH (MARINE ENGINEERING)

FLUID MECHANICS- I (T 2405 / T 1405)

Date: 19.06.2015

Time: -3 Hrs

Max. Marks: 100

Pass Marks: 50

PART – A
(Compulsory Questions)

(3 x 10 = 30 Marks)

1. a) Define. Surface tension and how is it related to capillary rise ?
- b) Write the units of dynamic and kinematic viscosities?
- c) Explain geometric and dynamic similarities .
- d) What are dynamic and kinematic similarities ?
- e) Explain total force and centre of pressure of an immersed surface. .
- f) Define the term (i) Hydraulic gradient line and (ii) Total energy line.
- g) Compare between forced vortex and free vortex flow..
- h) State Darcy's formula and Chezy's formula..
- i) How can you use venturimeter to measure discharge.
- j) Define steady and unsteady flow.

PART – B
(Answer any five of the following)

(5 x 14 = 70 Marks)

2. a) Deduce the expression for Reynolds number with the help of dimensional analysis.
- b) The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the viscosity μ , density and roughness k . Using Buckingham's π theorem obtain an expression for Δp

(6 + 8)

7. a) With the help of schematic diagram, explain how a zero power factor lagging armature current has the effect of weakening the main field by the armature reaction in a 3-phase Synchronous Generator and also show that electromagnetic force/torque produced in rotor is zero. (7)
- b) With the help of schematic diagram of a Synchronous Motor, explain how an unity power factor armature current has the cross magnetizing field effect by the armature reaction; also show that electromagnetic force/torque produced is in the direction motion of rotor. (7)
8. a) Derive an expression for winding distribution factor of a 3-phase Synchronous Generator. (5)
- b) A 2300-V (between line to line), 1000-kVA, 0.8-PF lagging, 60-Hz, two-pole, Y-connected Synchronous Generator has a synchronous reactance of 1.1Ω and an armature resistance of 0.15Ω . At 60 Hz, its friction and windage losses are 24 kW, and its core losses are 18 kW. Assume that the field current of the generator is adjusted to achieve rated voltage (2300 V) at full load conditions in each of the questions below.
- i) What is the efficiency of the generator at rated load?
- ii) What is the voltage regulation of the generator if it is loaded to rated kilo-volt-amperes with 0.8- Power Factor lagging loads? Also draw the voltage and current phasors.
- iii) What is the voltage regulation of the generator if it is loaded to rated kilovolt-amperes with 0.8 power factor leading loads? Also draw the voltage and current phasors. (3+3+3=9)
9. a) Discuss about the conditions necessary for paralleling of two three phase alternators. (7)
- b) Using phasor diagram, derive an expression for 3-phase output power $\left(\frac{3VE \sin \delta}{X_s} \right)$ and torque $\left(\frac{3VE \sin \delta}{\omega X_s} \right)$ for synchronous generator loaded by a lagging power factor load current, where V=Terminal voltage per phase and E=No-load emf generated and δ is angle between them. (7)
