

FACULTY OF ENGINEERING
B.E. 2/4 (AE) II – Semester (Main) Examination, June 2014

Subject : Fluid Mechanics and Machinery

Time : 3 hours

Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

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| 1 | Differentiate between cohesion and adhesion. | 2 |
| 2 | A jet of water 40mm in diameter a velocity of 25 M/s. Find the power of the jet. | 3 |
| 3 | Define and distinguish between uniform and non-uniform flow. | 3 |
| 4 | Define stream function and velocity potential and show that they intersect orthogonally. | 3 |
| 5 | List out all the minor losses in pipe flows. | 2 |
| 6 | Define terms hydraulic gradient and total energy lines. | 2 |
| 7 | Define nominal thickness of boundary layer. | 2 |
| 8 | State the various efficiencies associated with turbines. | 3 |
| 9 | Define and write the equation for theoretical discharge of reciprocating pump. | 3 |
| 10 | State the function of draft tubes in a turbine. | 2 |

PART – B (50 Marks)

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| 11 | a) Discuss in detail the variation of the pressure. Also prove that the pressure for static fluid varies only in the vertical direction. | 5 |
| | b) Inside a 60mm diameter cylinder a piston of 59mm diameter rotates concentrically. Both the cylinder and piston are 80mm long. If the space between the cylinder and piston is filled with oil of viscosity 0.3 N.S/m^2 and a torque of 1.5 NM is applied. Find the speed of the piston and the power required. | 5 |
| 12 | a) Derive the continuity equation for three dimensional incompressible flow. | 5 |
| | b) A pipe line carrying oil of relative density 0.87 changes in size from 200mm at a position AA to 500mm diameter at position BB which is 4m higher than position AA. The pressures at AA and BB are 100 kN/m^2 and 60 kN/m^2 respectively. If the discharge is 200 lps. Calculate the loss of head and direction of flow. | 5 |

- 13 a) Define terms hydrodynamically smooth and rough pipes. 4
- b) The velocity along the centre line of 150mm diameter pipe conveying oil under laminar flow conditions is 3 M/s. The viscosity of the oil is 1.2 poise and its specific gravity is 0.9. Obtain 6
- A) The quantity of oil flowing in lps.
- B) The shear stress at the pipewall in N/m^2 .
- 14 A venturimeter is used to measure the flow of petrol in a pipeline which is inclined at 45° to the horizontal. The specific gravity of petrol is 0.81. The diameter of the pipe is 0.3m and throat area ratio of the meter is 4. If the difference in Mercury levels recorded by differential manometer is 50mm. Determine the flow rate of petrol. $c_d = 0.975$ 10
- 15 a) Define unit quantities with reference to turbine. 5
- b) A Turbine is to operate under a head of 25 meters at 200 RPM. The discharge is $9\text{M}^3/\text{S}$. If the turbine efficiency is 90% determine specific speed of the turbine. 5
- 16 A centrifugal pump impeller has diameter of 60cm and width of 6 cm at the outlet. The pump runs at 1450 RPM and delivers $0.8\text{M}^3/\text{S}$ against a head of 80M. The leakage loss after the Impeller is 4% of discharge, the external mechanical loss is 10 kw and hydraulic efficiency is 80%. Determine the blade angle at outlet, the power required and overall efficiency. 10
- 17 a) Explain the working of reciprocating pump with a neat sketch. 5
- b) Explain the working of gear pump with a neat sketch. 5
