F 3093 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Mechanical Engineering

FLUID MECHANICS (M)

(Prior to 2010 Admissions—Old Scheme)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Give examples where surface tension effects play a prominent role.
2. Give one example where pressure distribution is non-hydrostatic.
3. How can the unsteady flow be transformed to steady flow ?
4. Can Bernaulli's equation be applied to a forced vertex flow ?
5. Differentiate between momentum equation and impulse momentum equation.
6. List all the assumptions in derivative of Euler's equation.
7. What is magnus effect ?
8. What is the effect of pressure gradient an boundary layer separation ?
9. What do you mean by 'viscous flow' ?
10. Why the Prandtl's velocity distribution is called 'universal' ?

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(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm.

Or

12. A Caisson for closing the entrance to a dry dock is of trapezoidal form 16 m wide at the top and 10 m wide at the bottom and 6m deep. Find the total pressure and centre of pressure on the caisson if the water on the outside is just level with the top and dock is empty.

13. The velocity potential function (ϕ) is given by an expression $(\phi) = -\frac{xy^3}{3} - x^2 + \frac{x^3 y}{3} + y^2$

    (a) Find the velocity components in x and y direction.

    (b) Show that (ϕ) represents a possible case of flow.

Or

14. A cylindrical vessel 15 cm in diameter and 40 cm long is completely filled with water. The vessel is open at the top. Find the quantity of water left in the vessel, when it is rotated about its vertical axis with a speed of 300 r.p.m.

15. State the different devices that one can use to measure the discharge through a pipe and also through an open channel. Describe one of such devices with a neat sketch and explain how one can obtain the actual discharge with its help ?

Or

16. An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential nanometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil specific gravity 0.9 when the coefficient of discharge of the meter is 0.64.

17. From fundamentals derive an expression for lift force acting an a rotating cylinder.

Or

18. A crude oil of Kinematic viscosity 0.4 stoke is flowing through a pipe of a diameter 300 mm at the rate of 300 litres per sec. Find the head lost due to friction for a length of 50 m of the pipe.

19. The difference is water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively is 12m. Determine the rate of flow of water if coefficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering minor losses also.

Or

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20. Explain :

    (a) Siphon losses in pipes. (4 marks)

    (b) Hydraulic jump. (4 marks)

    (c) Chezy's equation. (4 marks)

(5 × 12 = 60 marks)