Total No. of Questions – [9] Total No. of Printed Pages: 2

G.R. No.	

DECEMBER 2018 / END-SEM

F. Y. M. TECH. (Civil-WREE) (SEMESTER - I)

COURSE NAME: Advanced Fluid Mechanics

COURSE CODE: CVPA11181 P118-121 (ESE)

(PATTERN 2018)

Time: [3 Hour] [Max. Marks: 50]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4 OR Q.5, Q.6 OR Q.7, Q.8 OR Q.9**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) Check whether the stream function ψ= 5xy is irrotational and if so determine the corresponding potential function Φ) [3 marks]

OR

b) Define source flow. Derive equations of streamlines and potential function for the same [3 marks]

Q.2) a) Oil having viscosity of 0.08 kg/ms flows through 100 mm diameter pipe. The laminar flow velocity distribution is given by $u = 1.4\left[1-\left(\frac{r}{R}\right)^2\right]$ where R is radius of pipe and r is radial coordinate. Determine shear stress at the wall. [3 marks]

OR

b) For the data of Q.2 a calculate the pressure drop for 1 m length of pipe [3 marks]

Q.3) a) Discuss development of boundary layer over a flat plate [2 marks]

OR

b) Explain the process of boundary layer separation [2 marks]

Q.4) a) Derive $\frac{v_{max}-v}{V_*} = 5.75\log_{10}\left(\frac{R}{y}\right)$ for turbulent flow in pipes [6 marks]

b) Discuss the types of turbulent flow [4 marks]

c) Discuss Reynolds' rules of averages [4 marks]

OR

Q.5) a) Derive Reynolds equation of motion [10 marks]

b) Discuss Hydrodynamically smooth and rough pipes [4 marks]

Q. 6) a) Derive equation for loss of energy due to sudden expansion in flow through pipes

[4marks]

b) When a sudden contraction from 60 cm to 30 cm diameter is introduced in a horizontal pipeline, the pressure drops from 100kPa at the upstream of the contraction to 80 kPa on the downstream. Assuming a coefficient of contraction of 0.65 (i) estimate the flow rate in the pipe (ii) the loss of head due to contraction [10 marks]

OR

Q.7) a) Explain procedure to solve pipe network problem [6 marks]

b) Derive Dupit's equation for equivalent pipe [4 marks]

c) Explain pipes in series and pipes in parallel [4 marks]

Q.8) a) A high tension cable 5 cm in diameter is strung out between two towers. At a wind velocity of 80 kmph calculate the (i) drag per unit length of cable (ii) frequency of vortex shedding (ρ_{air}= 1.2 kg/m^3, v= 1.5 x 10-5 m^2/s, 10^4<Re<5x10^5 C_D = 1.2, Re>5x10^5 C_D = 0.35) [8 marks]

b) Discuss development of lift over an airfoil [6 marks]

OR

Q.9) a) Discuss drag on cylinder and sphere when submerged in fluid [8 marks]

b) Explain the polar diagram [6 marks]