Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM-IV(Civil Engineering)

REGULAR EXAMINATION– APRIL-JUNE 2016

2CI405 Fluid Mechanics -II

TIME: 3 HRS TOTAL MARKS: 60

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 (a) Enunciate Newtown's law of viscosity and distinguish between Newtonian and Non - Newtonian fluids. (05)

(b) Show that the streamlines and equipotential lines form a net of mutually perpendicular lines (05)

OR

Q. 1 (a) Two horizontal plates are placed 12.5 mm apart, the space between them being filled with oil of viscosity 14 poise. Calculate the shear stress in the oil if the upper plate moves with the velocity of 2.5 m/ sec. (05)

(b) If $u=-4\ ax(ax^2 - 3y^2)$ and $v=4\ ay(3x^2 - y^2)$, Examine whether these velocity components represent a possible flow? If so, whether the flow is rotational or irrotational. (05)

Q.2(a) State Bernoulli's equation. State what each terms represents. What are the assumptions made while deriving the Bernoull's equation. (06)

(b) A fluid of viscosity 5 poise and specific gravity 1.20 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 147.15 N/m^2. find (i) Pressure gradient, (ii) Average velocity and (iii) Reynolds number of the flow. (04)

OR

Q.2 (a) Derive an expression for Shear stress distribution for viscous flow through a circular pipe. Also sketch shear stress and the velocity distribution across a section of pipe. (06)

(b) A smooth wrought iron pipe 0.2 m in diameter carries crude oil at a velocity of 2.5 m/s. find the loss of head per 100 m . Take the kinematic viscosity as 0.4 stokes and specific gravity as 0.90 (04)

Q.3 Write a short note on: **(Any Two)** (10)

(i) Hydro dynamically Smooth & Rough Boundaries.
(ii) Laminar sub layer
(iii) Stream Function and velocity Potential function

SECTION: II

Q.4(a) Derive condition of most economical trapezoidal channel section. (

(b) Explain Capillary tube method for determination of viscosity of fluid with neat sketch. (05)

OR

Q.4(a) Find the bed slope of trapezoidal channel of bed width 6 m, depth of water 3 m and side slope of 3horizontal to 4 vertical, when the discharge through the channel is 30 m^3/s. Take C= 70. (05)

(b) In the model test of spillway the discharge and velocity of flow over the model were 2 m^3/s and 1.5 m/s respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size. (05)

Q.5(a) State and explain Buckingham's π – theorem (06)

(b) A trapezoidal channel with side slope of 3 horizontal to 2 vertical has to be designed to convey 10 m^3/s at a velocity of 1.5 m/s. so that the amount of concrete lining for the bed and side is minimum. Find the wetted perimeter and slope of bed. Take value of Manning's N = 0.014. (04)

OR

Q.5(a) What is specific energy and specific energy curve? Explain with neat sketch. (06)

(b) Find an expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity V in a fluid of density ρ and dynamic viscosity μ by using Rayleigh's method. (04)

Q.6 Explain in brief: **(Any Two)** (10)

(i) Hydraulic Grade Line and Total Energy Line
(ii) Potential function and Stream function
(iii) Critical depth and Critical flow

----------END OF PAPER--------