



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY
DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL DIPLOMA

IN

CIVIL ENGINEERING

SUBJECT: Fluid Mechanics

PAPER NO : 578/15/S06

DURATION: 3 hours

MARCH / APRIL 2022 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATES

Answer any five (5) questions

This paper consists of 3 printed pages.

QUESTION 1

- a) What is the difference between dynamic viscosity and kinetic viscosity? State their units of measurement. (6 marks)
- b) State the hydrostatic law and prove that $P = \rho gh = \rho gz$. (7 marks)
- c) A pipe of diameter 400mm carries water at a velocity of 25m/s. The pressure at the points A and B are given as 29, 43 N/cm² and 22,563N/cm² respectively while the datum head at A and B are 28m and 30m respectively. Find the loss of head between A and B. (7 marks)

QUESTION 2

Find the discharge of water flowing through a pipe 30cm diameter placed in an inclined position where a venturimeter is inserted, having a throat diameter of 15cm. The difference of pressure between the main and throat is measured by a liquid of sp.gr 0.6 in an inverted U-tube which gives a reading of 30cm. The loss of head between the main and throat is 0.2 times the kinetic head of the pipe. (20 marks)

QUESTION 3

A cubical tank sides of 1.5m. it contains water for the lower 0.6m depth. The upper remaining part is filled with oil of specific gravity 0.9. Calculate for one vertical side of the tank:

- a) Total pressure
- b) Position of centre of pressure (20 marks)

QUESTION 4

- a) A circular tank of diameter 4m in contains water up to a height of 5m. The tank is provided with an orifice of diameter 0,5m at the bottom. Find the time taken by water:
- i) To fall from 5m to 2m. (6 marks)
- ii) For co completely emptying the tank. $CD=0.6$ (6 marks)

- b). An oil sp.gr 0.7 is flowing through a pipe of diameter 300mm at the rate of 500 litres/ second. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take $V=0,29$ strokes. (8 marks)

QUESTION 5

- a) Define:
- i) Vena contracta (2 marks)
 - ii) Coefficient of discharge (2 marks)
 - iii) Specific gravity (2 marks)
 - iv) Capillarity (2 marks)
- b) Find the discharge through a trapezoidal notch which is 1m wide at the top and 0.40m at the bottom and is 30cm in height. The head of water on the notch is 20cm. Assume Cd for the rectangular portion as 0,62 while for triangular portion= 0,60. (12 marks)

QUESTION 6

- a) State any five (5) sources of minor energy losses in pipes. (5 marks)
- b) Find the diameter of circular sewer pipe which is laid at a slope of 1 in 8000 and carries a discharge of 800 litres per second when flowing half full. Take the value of Manning's $N=0,020$. (15 marks)

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