**Enrollment No: _____ Exam Seat No:_____**

**C.U.SHAH UNIVERSITY**
**Summer Examination-2016**

**Subject Name : Fluid Mechanics-II**

**Subject Code : 4TE04FLM1** **Branch: Civil Engineering**

**Semester : 4** **Date : 10/05/2016** **Time : 02:30 To 05:30** **Marks : 70**

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

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**Q-1** **Attempt the following questions:** **(14)**

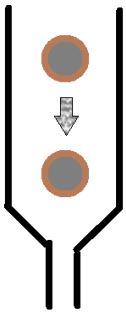
**a)** What is Unit of Froude's Number ? (1)

**b)** Write Dimension of 'Force' (1)

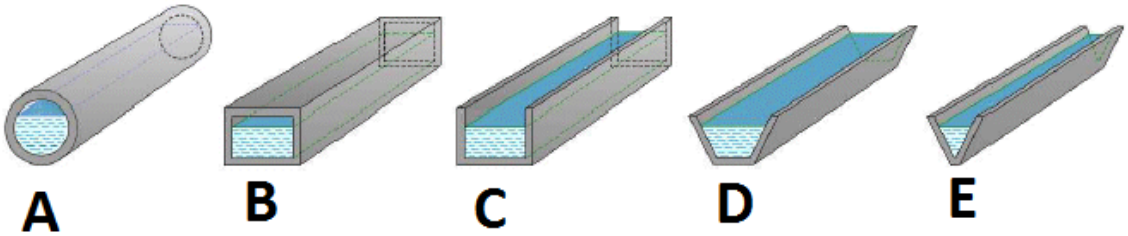
**c)** Which type of flow will you prefer in normal channel like following photo ? (1)

**d)** Which method of 'Viscosity measurement' shows figure ? (1)

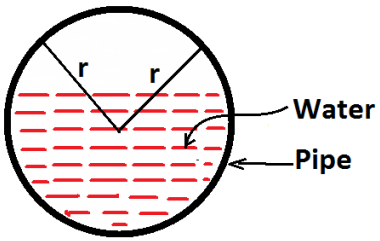
(A) Rotating Cylinder method
(B) Falling sphere method
(C) Capillary tube method
(D) Capillary tube viscometer



**e)** Which of the following shape will you prefer for channel ? (construction point of view) (1)
*(note: All channels have same cross sectional area)*



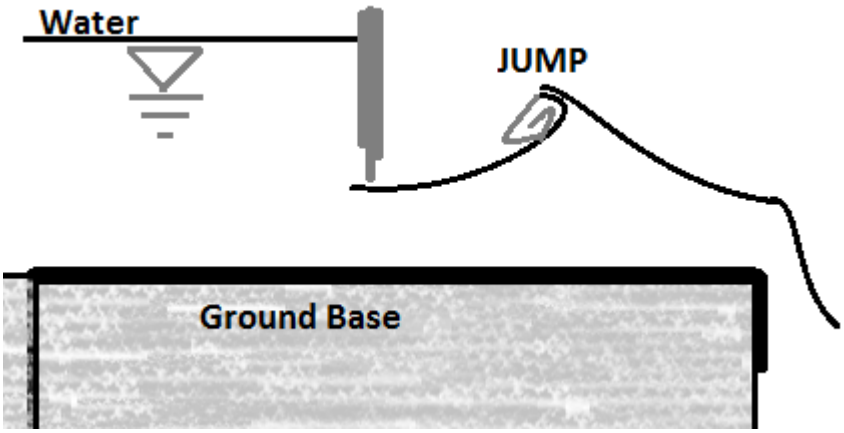
**f)** What is hydraulic mean depth formula of following section? (1)




**g)** Fr=1.00 : Which type of flow is this ? (1)

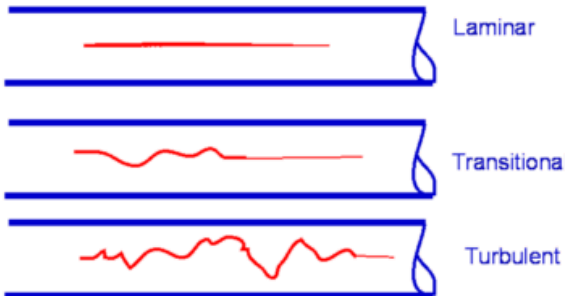
**h)** Write down chezy's equation (with terms) (1)

**i)** Which kind of hydraulic jump profile is this ? (1)




**j)** Which type of material is better for pipe line if water is salty ? (1)
(A) PVC (B) Iron (C) Aluminum (D) Concrete

**k)** What is raynold's number for following types of flow ? (1)




**l)** Which is best design range of Froude number for hydraulic jump ? (1)

**m)** Draw sketch of 'Pure rotation' (1)

**n)** How will you convert super-critical flow into sub-critical flow ? (1)

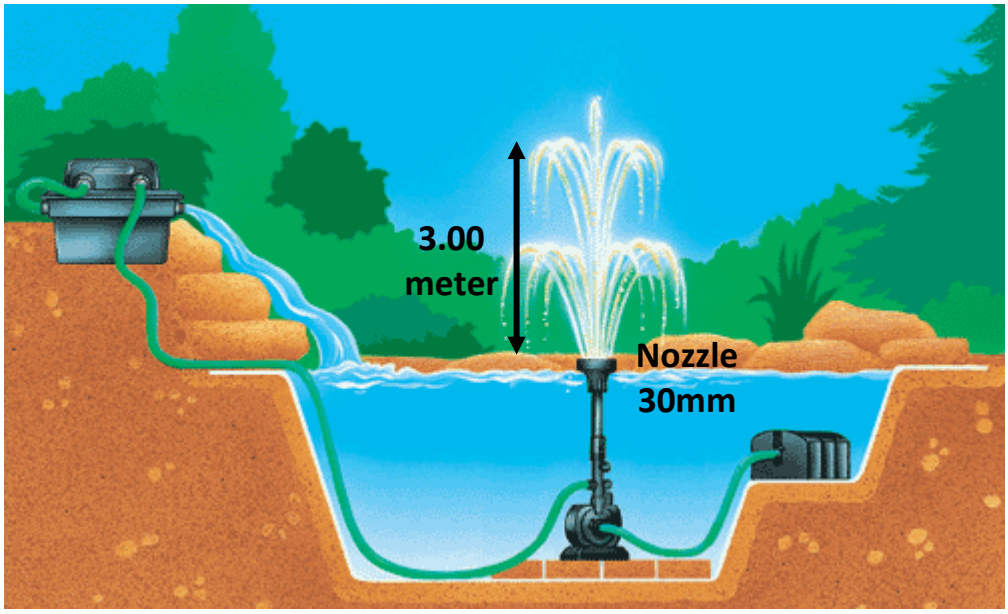
**Attempt any four questions from Q-2 to Q-8**

**Q-2** **Attempt all questions** **(14)**

**(A)** Give Brief Introduction to C.F.D. (4)

**(B)** Write down note on hydraulic ram with sketch. (5)

**(C)** A fountain of water from a 30mm diameter nozzle is directed vertically upwards. Assuming that jet remains circular & neglecting any loss of energy. What will be the diameter at a point 3m above the nozzle, if velocity with which jet leaves the nozzle is 15m/s. (5)




**Q-3** **Attempt all questions** **(14)**

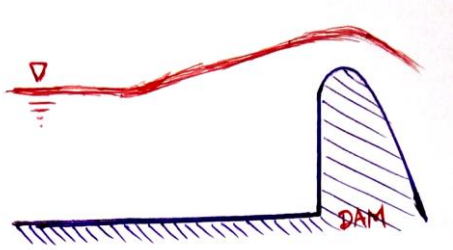
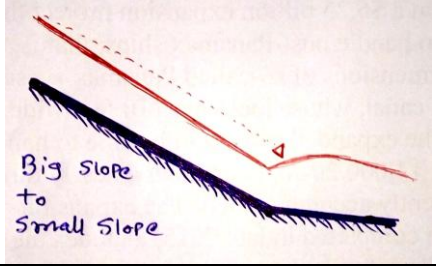
**(A)** What are undistorted & distorted models ? and write note on 'Scale ratio for distorted models'. (6)

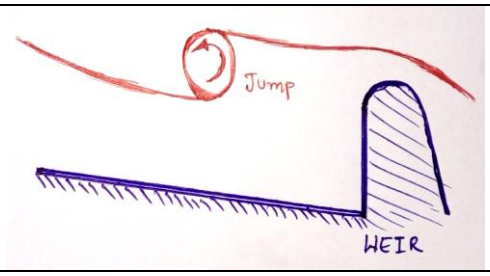
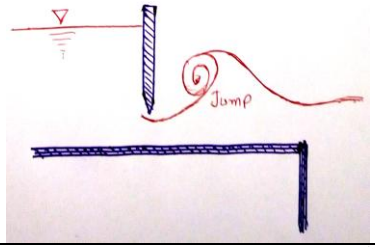
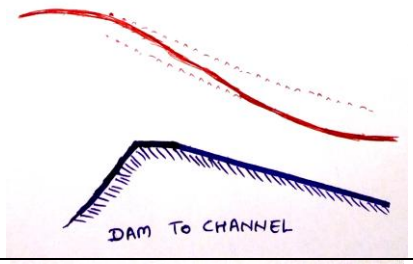
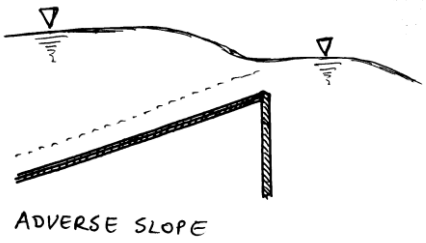
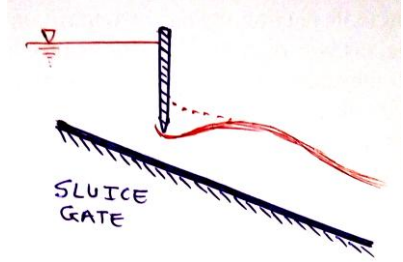
**(B)** Using Buckingham's **π** theorem, show that the velocity through a circular orifice is given by $V = \sqrt{2gH}\ \phi\left[\frac{D}{H}, \frac{\mu}{\rho VH}\right]$. Where H is head causing flow, **D** is the diameter of the orifice, **μ** is co-efficient of viscosity. **P** is the mass density and **g** is the acceleration due to gravity. (8)

**Q-4** **Attempt all questions** **(14)**

**(A)** Give name of following Surface profiles. (7)

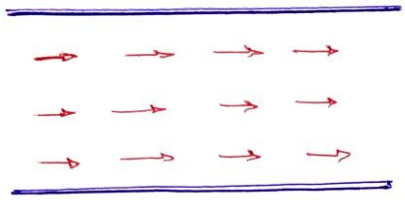
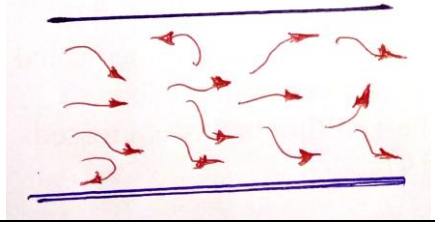
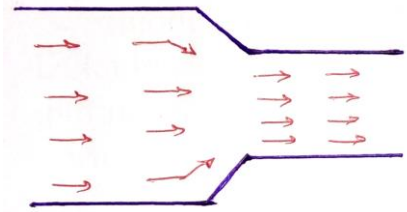
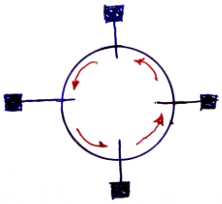
*(note : do not draw sketch again in answer book)*

| Sr.no. | Profile | Sr.no. | Profile |
|---|---|---|---|
| 1 |   | 5 |   |

| | | | |
|---|---|---|---|
| **2** |  | **6** |  |
| **3** |  | **7** |  |
| **4** |  | | |

**(B)** Name following flows ; shown in figures (4)

*(Note : Do not draw sketch again in answer book)*

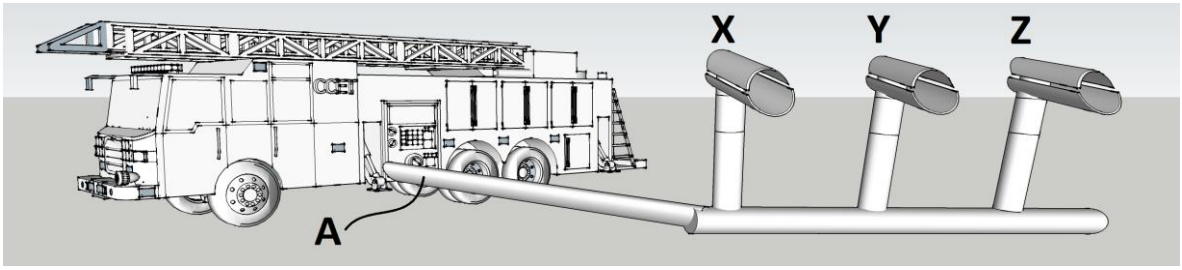
| Sr.no. | Flow | Sr.no | |
|---|---|---|---|
| 1 |  | 3 |  |
| 2 |  | 4 |  |

**(C)** The population of 'Baroda' town is 0.6 Million. The town gets water from a reservoir through a pipe 50 km long. The per capita requirement of water is 200 litters/day and half of the total demand of 'surendranagar' is to be supplied in 10 hours. The flow is by gravity with a level difference of 18m between the reservoir level and exit end of the pipe. (3)

If $f$=0.025 for the pipe, find suitable diameter of the pipe.

**Q-5** **Attempt all questions** **(14)**

**(A)** There is fire in one building; and fire brigade's water tanker is ready to take action. Refer following data and find out 'velocity and discharge of water in pipe-Z' and also decide which one of pipe will you choose for water discharge out of X-Y-Z pipes ? (5)




Data :
Input pipe from Tanker is A
$V_A$ = 5 m/s, $D_A$ = 0.50 m
Three division from pipe – A that are X,Y & Z
$V_x$ = 2 m/s, $D_x$ = 0.20 m
$V_y$ = 100 cm/s, $D_y$ = 0.1 m
$D_z$ = 5 cm,

**(B)** Write down equation of motions. (4)

**(C)** Draw specific energy curve, explain it and Give application of specific curve. (5)

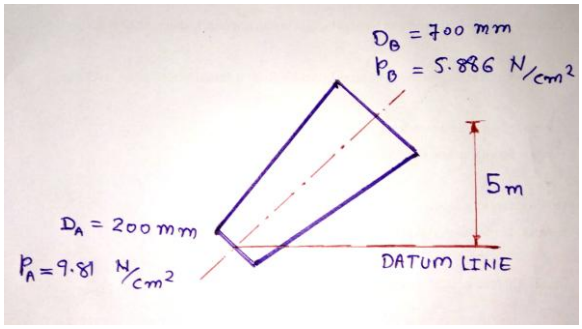
**Q-6** Procedure for solving problems by Buckingham's $\pi$ theorem. **(14)**

**Q-7** **Attempt all questions** **(14)**

**(A)** Derive 'dynamic equation of gradually varied flow'. (7)

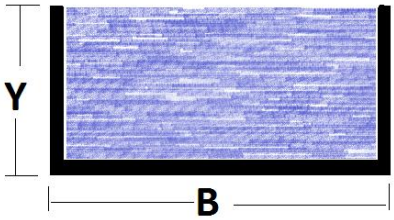
**(B)** Refer the following figure and determine the loss of head & direction of flow. specific gravity of fluid is 0.90, Discharge Q = 300 liters/sec. (7)

$D_a$ = 200mm, $p_a$ = 9.81 N/cm$^2$, $D_b$=700mm, $p_b$=5.886 N/cm2, Datum line height = 5m




**Q-8** **Attempt all questions** **(14)**

**(A)** Derive equation for most economical section of following figure. (5)




**(B)** Draw only sketch of 'Governing mechanism of pelton turbine' (4)

**(C)** Write short note on 'falling sphere method'. (5)