Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2024

CE3CO24 Hydraulic Engineering

Programme: B.Tech. Branch/Specialisation: CE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. The Froude's number for a flow in a channel section is less than 1. What type of flow is it? **1**

(a) SubCritical (b) Critical

(c) Supercritical (d) Tranquil

ii. Calculate the mean hydraulic depth of a channel having top width of 6m and cross-sectional area of $30m^2$: **1**

(a) 4 m (b) 6 m (c) 5 m (d) 7 m

iii. For a channel to be economical which of the following parameters should be minimum- **1**

(a) Wetted perimeter (b) Wetted area

(c) Section factor (d) Hydraulic depth

iv. Energy per unit weight of water measured with respect to the datum is called as _____. **1**

(a) Total energy (b) Specific energy

(c) Velocity head (d) Datum head

v. Hydraulic jump depends upon- **1**

(a) Temperature (b) Pressure

(c) Initial fluid speed (d) Volumetric changes

vi. When the hydraulic jump is in a moving form it is called _____. **1**

(a) Negative surge (b) Positive surge

(c) Turbulent surge (d) Accelerated surge

vii. Factor of safety against overturning should not be less than- **1**

(a) 1.5 (b) 2.5 (c) 3.5 (d) 4.5

viii. Major external forces acting on dam- **1**

(a) Ice pressure (b) Uplift pressure

(c) Wind pressure (d) Water pressure

P.T.O.

ix. The central core of the zoned embankment type earth dam- **1**
(a) Checks the seepage
(b) Prevents piping
(c) Gives stability to the central impervious fills
(d) Distribute the load over a large area

x. Stone pitching or rip-rap is generally provided to avoid _____. **1**
(a) Over-topping (b) Erosion of U/s and d/s face
(c) Cacking due to frost action (d) Gully formation

Q.2 i. Write down the comparison between open channel flow and pipe flow. **2**
ii. Explain the classification of open channel flow. **3**
iii. Derive an expression for Chezy's Formula. **5**
OR iv. Derive all the conditions for most economical rectangular channel section. **5**

Q.3 i. Define critical depth and critical velocity. **2**
ii. What is specific energy curve? Derive an expression for specific energy curve with diagram. **8**
OR iii. Derive the equation for gradually varied flow for a rectangular channel section. **8**

Q.4 i. Explain hydraulic jump with its types. **3**
ii. Derive an expression for hydraulic jump in rectangular channel section. **7**
OR iii. What is meant by energy dissipaters? Explain energy dissipaters for various cases with basic principle of energy dissipater. **7**

Q.5 i. Define gravity dam. **2**
ii. Explain various causes of failure of gravity dam. **3**
iii. Explain various forces acting on gravity dam. **5**
OR iv. Design the practical profile of a gravity dam of stone masonry given the following data- **5**
R.L. of base of dam=1450m.
R.L. of FRL=1480.5m
Specific gravity of the masonry=2.4
Safe compressive stress for masonry=1200 kN/m^2
Height of wave=1m.

Q.6 i. Define earthen dam with diagram. **2**
ii. Explain the type of earthen dam. **3**
iii. Explain the causes of failure of earthen dam. **5**
OR iv. For the earth dam of homogeneous section with a horizontal filter, draw the top flow line. If the coefficient of permeability of the soil material used in the dam is $5*10^{-4}$cm/sec. Find the seepage flow per unit length of dam. **5**

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Marking Scheme

Hydraulic Engineering (T) - CE3CO24(T)

Q.1	i)	The Froude's number for a flow in a channel section is less than 1. What type of flow is it? a)SubCritical	**1**
	ii)	Calculate the mean hydraulic depth of a channel having top width of 6m and cross-sectional area of 30m2. C)5m	**1**
	iii)	For a channel to be economic which of the following parameters should be minimum. A) Wetted perimeter	**1**
	iv)	Energy per unit weight of water measured with respect to the datum is called as _____ b) Specific energy	**1**
	v)	Hydraulic jump depends upon C) Initial fluid speed	**1**
	vi)	When the hydraulic jump is in a moving form it is called _____ B) Positive surge	**1**
	vii)	Factor of safety against overturning should not be less than (A) 1.5	**1**
	viii)	Major external forces acting on dam (D) water pressure	**1**
	ix)	The central core of the zoned embankment type earth dam (A) checks the seepage	**1**
	x)	Stone pitching or riprap is generally provided to avoid _____ (B) erosion of U/s and d/s face	**1**
Q.2	i.	Comparison between open channel flow and pipe flow? Each type give 1 Mark*2=2 Marks	**2**
	ii.	Explain the classification of open channel flow? Each classification give 1 Mark *3=3Marks	**3**
	iii.	Derive an expression For Chezy's Formula? 4 Marks Diagram 1 Marks	**5**
OR	iv.	First conditions 2.5 Marks Second condition 2.5Marks	**5**
Q.3	i.	Critical depth 1 Mark Critical velocity 1 Mark	**2**
	ii.	What is Specific Energy Curve 3 Marks Derivation 5 Marks	**8**
OR	iii.	Derivation for gradually varied flow Derivation 6 Marks Daigram 2 Marks	**8** **5**
Q.4	i.	Hydraulic Jump 1 Mark Types 2 Marks	**3**
	ii.	Expression for hydraulic jump 6 Marks Diagram 1 Mark	**7**
OR	iii.	What is meant by energy dissipaters? 2 Marks Explain energy dissipaters for various cases with basic principle of energy dissipater? Each case one Mark=5*1Mark=5Marks	**7**
Q.5	i.	Define Gravity Dam 2 Marks	**2**
	ii.	Each causes of failure of Gravity Dam gives 1 Mark=1*3=3Marks	**3**
	iii.	Derive an expression for elementary profile of gravity dam Derivation 4 Marks Diagram 1 Marks	**5**
OR	iv	Check for low gravity dam or high gravity dam 2Marks Calculation of top width 1 Mark Calculation of u/s face 1 Mark Calculation of base width 1 Mark	**5**
Q.6	i.	Define Earthen dam 1 Marks Diagram 1 Marks	**2**
	ii.	Each type of Earthen dam 1 Marks each=1*3=3Marks	**3**
	iii.	Each causes of failure of Earthen dam 1 Marks each=1*5=5 Marks	**5**
OR	iv.	For the earth dam of homogeneous sction section with a horizontal filter,draw the top flow linbe.If the coefficient of permeability of the soil material used in the dam is 5*10^-4,Find the seepage flow per unit length of dam. for formula 2 Marks for correct ans 3 Marks	**5**

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[2]

[3]

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