

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Winter Examination – 2023

Course: B. Tech.

Branch: Civil Engineering

Semester: VII

Subject Code & Name: BTCVC701_Y20 & Design of Concrete Structures - II

Max Marks: 60

Date:02/01/2024

Duration: 3 Hr.

Instructions to the Students:

- 1. All the questions are compulsory.*
- 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.*
- 3. Use of non-programmable scientific calculators is allowed.*
- 4. Assume suitable data wherever necessary and mention it clearly.*
- 5. Use of IS 456 and IS 1343 is allowed.*

	(Level/ CO)	Marks
Q.1 Solve Any Two of the following.		12
A) Describe with neat sketch, behavior of a rectangular beam with torsional reinforcement subjected to torsion.	CO01	6
B) Calculate the resistance in pure torsion of a concrete beam rectangular in section, 250 mm wide and 300 mm deep when reinforced with 2 ϕ 10mm at top and 2 ϕ 12mm at bottom provided at an effective cover of 35 mm. Assume steel of grade Fe 415 and concrete of grade M 20.	CO01	6
C) Write the different design considerations for Torsion as per IS 456:2000.	CO01	6
Q.2 Solve Any Two of the following.		12
A) Design a circular pin ended column of 400 mm diameter and helically reinforced, with an unsupported length of 4.5 m to carry a factored load of 900 KN. Assume M30 concrete and Fe 415 steel.	CO02	6
B) Write the step-by-step procedure for design of a centrally loaded column as per IS 456:2000.	CO02	6
C) Explain different column interaction diagrams with neat sketch.	CO02	6
Q.3 Solve Any Two of the following.		12
A) Enlist the advantages of prestressed concrete structures over reinforced concrete structures?	CO03	6
B) Explain in brief Pre tensioning and Post tensioning methods of prestressing.	CO03	6
C) Explain with neat sketch Freyssinet system of prestressing.	CO03	6

Q.4 Solve Any Two of the following.		12
A) A Pre-stressed beam of size 300 mm X 650 mm is simply supported on a span of 9m. It carries a UDL of 30 kN/m over its entire span inclusive of its self weight. It is pre-stressed by tendons supplying 1600 kN force which are placed at 100 mm below the neutral axis. Calculate the extreme fiber stresses at end span (support) .	CO03	6
B) Explain the term Pressure Line for simply supported rectangular beam and draw neat sketch for, a) Pressure Line at Transfer b) Pressure Line under Service Loads	CO03	6
C) Explain with neat sketch cable profiles for, a) For a simply supported post-tensioned beam with high uniformly distributed load b) Post-tensioned continuous beam	CO03	6
Q. 5 Solve Any Two of the following.		12
A) What is structural audit? State the necessity of structural audit.	CO04	6
B) What is Loss of Prestress? Explain in detail a) Loss of Prestress due to Creep in Concrete b) Loss of Prestress due to Elastic Shortening of Concrete	CO03	6
C) Explain different stages in carrying out structural audit.	CO04	6

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Winter Examination-2023

Course: B. Tech.

Branch: Civil Engineering

Semester: VII

Subject Code & Name: BTCVC701 & Design of Reinforced & Prestressed Concrete Structures

Max Marks: 60

Date:02-01-2024

Duration: 3 Hrs.

Instructions to the Students:

1. All the questions are compulsory.
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3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.
5. Use of IS 456-2000, IS 1343-2012 is permitted.

(Level/CO) Marks

Q. 1 Solve Any Two of the following.

- | | | |
|---|----------|----------|
| A) Define torsion and derive equation for torsional stiffness for a member subjected to torsion. Assume suitable nomenclature. | (L2/CO1) | 6 |
| B) A reinforced concrete rectangular beam $b = 300$ mm, $d = 500$ mm and $D = 550$ mm is subjected to factored shear force $V_u = 75$ kN, $M_u = 170$ kNm, $T_u = 50$ kNm. Assume M 20 concrete, Fe 415 steel. Design the beam for limit state of collapse in torsion. (Skip transverse steel calculation step) | (L3/CO1) | 6 |
| C) A reinforced concrete rectangular beam of $b = 300$ mm, $d = 500$ mm and $D = 550$ mm subjected to factored shear force of 100 kN. Assuming % age of steel as 1% in the section, determine the factored torsional moment in the section if maximum steel for torsion is provided in the section. Assume M 30 grade concrete and Fe 415 Steel. | (L3/CO1) | 6 |

Q.2 Solve Any Two of the following.

- | | | |
|---|----------|----------|
| A) Explain the classification of column based on slenderness ratio. Also, state the provisions for longitudinal reinforcement and transverse reinforcement. | (L2/CO2) | 6 |
| B) Design the reinforcement in a column of size 500 mm x 700 mm subjected to an axial load of 2100 kN under service load. The column has an unsupported length of 3.0 m and effectively held in position and restrained against rotation at one end but not held in position nor restrained against rotation at the other end. Use M 25 concrete and Fe 415 Steel. | (L3/CO2) | 6 |
| C) Design a short column subjected to a factored load of 1400 kN and factored moment of 90 kNm about minor axis (y-y). The column has a length of 5 m with one end hinge and other end fixed. Use M25 grade concrete and Fe415 steel. | (L3/CO2) | 6 |

Q. 3 Solve Any Two of the following.

- A) Differentiate between pre-tensioning and post-tensioning methods of prestressed concrete. (L2/CO3) 6
- B) Explain with neat sketch 'Magnet Blaton system' of pretensioning. (L2/CO3) 6
- C) What are the advantages of prestress concrete over RCC? (L2/CO3) 6

Q.4 Solve Any Two of the following.

- A) List and explain the types of losses in the prestressed (pre-tensioned and post-tensioned) concrete beam. (L2/CO3) 6
- B) A prestressed concrete beam of rectangular section 300 mm wide and 600 mm deep has a span of 15 m. The effective force is 1520 kN at an eccentricity of 150 mm. The DL of the beam is 5 kN/m and LL on beam is 8 kN/m. Determine the extreme stresses in concrete at i) end span, ii) mid span. (L3/CO3) 6
- C) A post-tensioned beam 150 mm $\times$ 400 mm (b $\times$ h) spanning over 10 m. Each cable has a parabolic profile with a dip of 50 mm at mid-span and having a cross-sectional area of 250 mm². It has initial stress of 1200 MPa. If the cables are tensioned from one end, estimate the percentage loss in the cable due to friction at the anchored end. Assume $\mu = 0.35$, $k = 0.0015/\text{m}$. (L3/CO3) 6

Q. 5 Solve Any Two of the following.

- A) What is structural auditing? What are its advantages and how it is carried out? Explain. (L2/CO4) 6
- B) Design a post-tensioned hanger to carry an axial tension of PDL = 250 kN (dead load including self-weight) and PLL = 150 kN. The dimension of the hanger is 300 $\times$ 300 mm². Design the section without considering non-prestressed reinforcement. Tension is not allowed under service loads. The grade of concrete is M 35. The age at transfer is 28 days. Assume 15% long term losses in the prestress. The following properties of the prestressing strands are available from tests. Type of prestressing tendon : 7 wire strand, nominal diameter = 12.8 mm, nominal area = 99.3 mm², tensile strength (f_{pk}) = 1860 N/mm², modulus of elasticity = 195 kN/mm². (L3/CO4) 6
- C) Design a simply supported Type 1 prestressed beam with MT = 435kNm (including an estimated MSW = 55 kNm). The height of the beam is restricted to 920 mm. The prestress at transfer $f_{po} = 1035 \text{ N/mm}^2$ and the prestress at service $f_{pe} = 860 \text{ N/mm}^2$. Based on the grade of concrete, the allowable compressive stresses are 12.5N/mm² at transfer and 11.0N/mm² at service. The properties of the prestressing strands are: i) Type of prestressing tendon: 7-wire strand, ii) nominal diameter = 12.8 mm, iii) nominal area = 99.3 mm². Use preliminary design steps. (L3/CO4) 6

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE Supplementary Examination – 2023 Course: B. Tech. Branch : Civil Engineering Semester : 7th sem Subject Code & Name: BTCVC702_Y20 Infra Structure Engineering. Max Marks: 60 Date:04-01-24 Duration: 3 Hr.			
Instructions to the Students: 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
Q. 1	Solve Any Two of the following.		12
A)	Define airport and explain component of airport	CO2	6
B)	Define the following 1) Conning of wheel and 2 Gauge	CO1	6
C)	Explain different types of rail joints	CO1	6
Q.2	Solve Any Two of the following.		12
A)	What are different type of sleeper explain concrete sleeper in detail	CO1	6
B)	Define the term 1) Docks 2) Harbour	CO1	6
C)	What is creep and what are causes of creep	CO2	6
Q. 3	Solve Any Two of the following.		12
A)	Explain methods of tunneling in hard rock	CO1	6
B)	What is super elevation write objectives of super elevation	CO2	6
C)	Draw and explain right hand turn out in rail .	CO1	6
Q.4	Solve Any Two of the following.		12
A)	What is wind rose in airport .	CO3	6
B)	What are different components in bridges	CO1	6
C)	Draw a sketch showing component of harbour and define any two .	CO3	6
Q. 5	Solve Any Two of the following.		12
A)	What are sizes of harbour	CO2	6
B)	What is lining in tunnel	CO1	6
C)	Type of bridges with sketches	CO2	6
*** End ***			

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular/Supplementary Winter Examination – 2023

Course: B. Tech.

Branch : Civil Engineering

Semester : VII

Subject Code & Name: Infrastructure Engineering (BTCVC702)

Max Marks: 60

Date: 04/01/2024

Duration: 3 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Assume suitable data wherever necessary and mention it clearly.

	(CO)	Marks
Q. 1 Solve Any Two of the following.		12
A) Illustrate types of crossing with neat sketches.	CO 2	6
B) Explain necessity of Turnout with its components.	CO 2	6
C) Explain the characteristic of airport explain with sketch.	CO 5	6
Q.2 Solve Any Two of the following.		12
A) Define : a) Airport Capacity b) Backwash c) Span of wings d) Lighthouse e) Locomotive f) Coaches	CO 3	6
B) How Harbours are classified based on its utility and location.	CO 6	6
C) Define fixtures and fastening. Explain its types.	CO 2	6
Q. 3 Solve Any Two of the following.		12
A) (a) Define Hanger with its types. (b) Define Gauge with its types.	CO 5	6
B) What are the applications of Coning of wheel, Tilting of rail, Adzing of Sleeper?	CO 2	6
C) Describe the full-face method of Tunneling in hard rock with neat sketch.	CO 5	6
Q.4 Solve Any Two of the following.		12
A) Explain classification of tunnel based on Size and Shape.	CO 5	6
B) What is breakwater? Illustrate it with its types.	CO 6	6
C) Explain necessity of Tunnel Lining & Tunnel Drainage.	CO 5	6
Q. 5 Solve Any Two of the following.		12
A) Write a short note on methods of tunneling in soft rock.	CO 5	6
B) Define : a) Dock b) Tides c) Waves d) Runway e) Swash f) Currents g) Wharf	CO 4	6
C) Illustrate the term Airport Lighting.	CO 3	6

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Winter Examination-2023

Course: B. Tech.

Branch: Civil Engineering

Semester: VII

Subject Code & Name: BTCVC703_Y20 Water Resource Engineering

Max Marks: 60

Date: 06-01-24

Duration: 3.00 Hrs.

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

	(Level/CO)	Marks
Q. 1 Solve the following questions.		12
A) Explain types of irrigation system.	CO1	06
B) Explain hydrologic cycle with neat labelled sketches	CO2	06
Q.2 Solve Any Two of the following.		12
A) Explain forces acting on a gravity dam with neat labelled diagram.	CO2	06
B) Explain the various levels in reservoir with suitable diagram.	CO2	06
C) Explain the classification of reservoir?	CO2	06
Q. 3 Solve Any Two of the following.		12
A) What do you mean by spillways? Enlist the types of spillways. Any two necessity of spillways	CO2	06
B) Write short note on cross drainage works in detail with neat labelled diagram	CO2	06
C) Why should lining be provided in canals? What are the merits and demerits of canal lining?	CO2	06
Q.4 Solve Any Two of the following.		12
A) Explain various forms of precipitation.	CO1	06
B) Define the following terms: 1. Specific yield	CO1	06
2. Unit Hydrograph		
3. Flood Hydrograph		
C) Explain classification of well ?	CO 2	06
Q. 5 Solve the following questions.		12
A) Explain rain water harvesting ?	CO 1	06
B) What are the preventive and curative measures of water logging?	CO1	06

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Winter Examination – 2023

Course: B. Tech.

Branch: Civil Engineering

Semester: VII

Subject Code & Name: BTCVC 703 Construction Techniques

Max Marks: 60

Date: 06/01/2024

Duration: 3 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
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	(Level/CO)	Marks
Q. 1 Solve Any Two of the following.		12
A) What is ripper? What are the different types of rippers? State the applications of Rippers	CO1	6
B) Enlist the various types of Rollers and explain any one.	CO1	6
C) Write down working and application of power shovel with neat labelled diagram.	CO1	6
Q.2 Solve Any Two of the following.		12
A) Enlist various methods of dewatering. Explain different method of dewatering in excavation.	CO2	6
B) What are the different properties which are considered in selecting an explosives?	CO2	6
C) Define jack hammers. Explain the working of jack hammer.	CO2	6
Q. 3 Solve Any Two of the following.		12
A) Describe the process of underwater concreting with neat labelled diagram.	CO3	6
B) Define grouting. Describe the various materials used for grouting. Write down advantages of grouting.	CO3	6
C) Explain the working of ready-mix concrete plant with their components. Draw a neat labelled diagram.	CO2	6
Q.4 Solve Any Two of the following.		12
A) What do you mean by Hoisting Equipment? Explain Rail mounted tower crane with suitable diagram.	CO4	6

B) Enlist various types of dredgers. Explain with neat labelled diagram: Grab dredger **CO4** **6**

C) Write down advantages and disadvantages of pre-fabrication. **CO4** **6**

Q. 5 Solve Any Two of the following. **12**

A) Write down application of Diaphragm wall. Explain the method of construction of Diaphragm wall. **CO3** **6**

B) Explain the operation involved in hot mix plan with neat sketch. **CO4** **6**

C) What are the causes of accidents on construction site? How to prevent it. **CO4** **6**

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Winter Examination – 2023

Course: B. Tech.

Branch : Civil Engineering

Semester : 7th

Subject Name: Professional Practices

Subject Code: BTCVC704

Max Marks: 60

Date: 09/01/2024

Duration: 3 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO) Marks

Q. 1 Solve Any Two of the following.

12

- A) Examine the various factors that can significantly influence the process of estimation in construction projects. **CO1 6**
- B) Fig 1. Shows the plan of superstructure wall (0.3 m) of a single room building of 6m x 5m, and sections represent the cross-sections of the walls with foundation. Estimate (Long wall and short wall method) the quantities of 1. Earthwork in excavation in foundation. (2 Marks). 2. Concrete in foundation. (2 Marks). 3. Brickwork in superstructure. (2 Marks). **CO1 6**

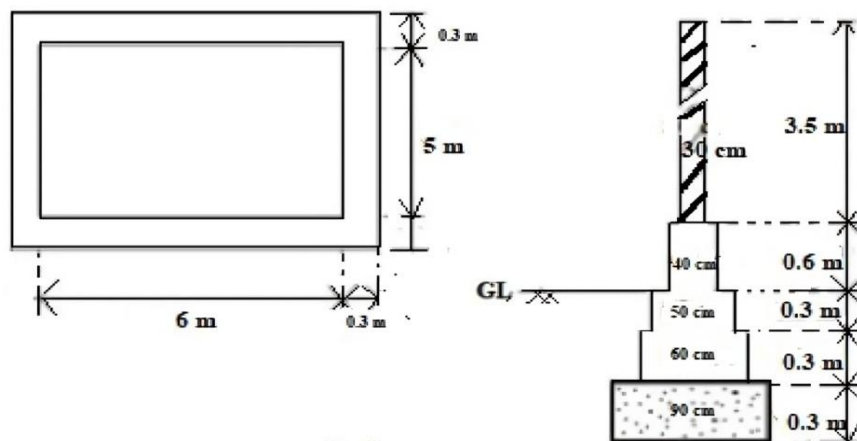


Fig 1

- C) What is specification? What are the purpose of specification? (2 +4)Marks **CO1 6**

Q.2 Solve Any Two of the following.

12

- A) Why the rate analysis is necessary? Define and explain the concept of price escalation in the context of construction projects. (2 +4)Marks **CO2 6**

B)	Find out the materials required for the 15 Cu.m RCC work (1:2:4) excluding Steel.	CO2	6
C)	Analyze the applicability of the Standard Schedule of Rates in Public-Private Partnership (PPP) projects.	CO2	6
Q. 3	Solve Any Two of the following.		12
A)	Describe the step-by-step procedure for inviting tenders in the context of a construction project.	CO3	6
B)	Explain the concept of Public-Private Partnership (PPP) with specific reference to the Build-Operate-Transfer (BOT) model. Outline the advantages that such partnerships. (3 +3)Marks	CO3	6
C)	Examine the various risks associated with the tendering process in construction projects.	CO3	6
Q.4	Solve Any Two of the following.		12
A)	Explain the organizational setup of a Public Works Department (P.W.D.).	CO3	6
B)	Illustrate essentials of a legally valid contract.	CO3	6
C)	Discuss the role of arbitration in resolving disputes in construction projects.	CO3	6
Q. 5	Solve Any Two of the following.		12
A)	Describe valuation and its principles. (2 +4)Marks	CO4	6
B)	Assess the complexities faced by valuers in identifying and quantifying obsolescence, and propose innovative strategies to address these challenges within the context of property valuation.	CO4	6
C)	A building having construction cost of Rs:15,000,00 has been constructed on a 200 m ² freehold land in metro city. The rate of land in the neighbourhood is Rs 2500/ m ² . The outstanding such as sinking fund and taxes collectively is Rs:30000/annum. Determine the net rent of the property considering 9% cost of construction and 6% of the cost of land. 1. Determine gross rent of the property after considering the outgoing (annually and monthly).	CO4	6

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Winter Examination – 2023

Course: B. Tech.

Branch : Civil Engineering

Semester : 7th

Subject Name: Professional Practices

Subject Code: BTCVC704

Max Marks: 60

Date: 09/01/2024

Duration: 3 Hr.

Instructions to the Students:

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(Level/CO) Marks

Q. 1 Solve Any Two of the following.

12

- A) Examine the various factors that can significantly influence the process of estimation in construction projects. **CO1 6**
- B) Fig 1. Shows the plan of superstructure wall (0.3 m) of a single room building of 6m x 5m, and sections represent the cross-sections of the walls with foundation. Estimate (Long wall and short wall method) the quantities of 1. Earthwork in excavation in foundation. (2 Marks). 2. Concrete in foundation. (2 Marks). 3. Brickwork in superstructure. (2 Marks). **CO1 6**

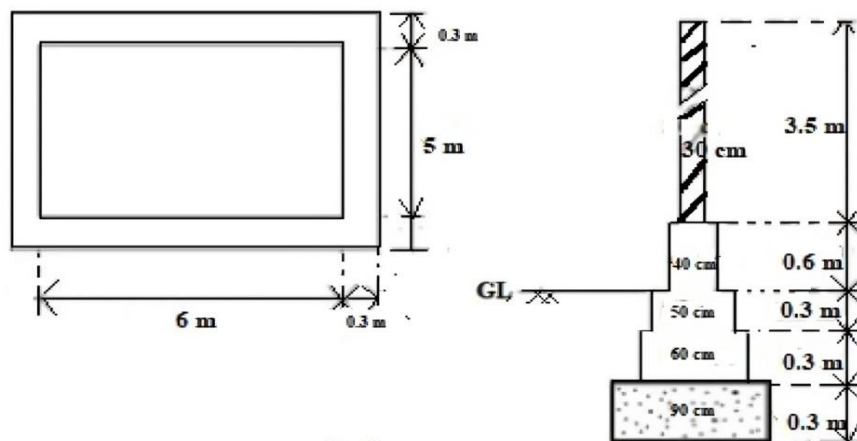


Fig 1

- C) What is specification? What are the purpose of specification? (2 +4)Marks **CO1 6**

Q.2 Solve Any Two of the following.

12

- A) Why the rate analysis is necessary? Define and explain the concept of price escalation in the context of construction projects. (2 +4)Marks **CO2 6**

B)	Find out the materials required for the 15 Cu.m RCC work (1:2:4) excluding Steel.	CO2	6
C)	Analyze the applicability of the Standard Schedule of Rates in Public-Private Partnership (PPP) projects.	CO2	6
Q. 3	Solve Any Two of the following.		12
A)	Describe the step-by-step procedure for inviting tenders in the context of a construction project.	CO3	6
B)	Explain the concept of Public-Private Partnership (PPP) with specific reference to the Build-Operate-Transfer (BOT) model. Outline the advantages that such partnerships. (3 +3)Marks	CO3	6
C)	Examine the various risks associated with the tendering process in construction projects.	CO3	6
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A)	Explain the organizational setup of a Public Works Department (P.W.D.).	CO3	6
B)	Illustrate essentials of a legally valid contract.	CO3	6
C)	Discuss the role of arbitration in resolving disputes in construction projects.	CO3	6
Q. 5	Solve Any Two of the following.		12
A)	Describe valuation and its principles. (2 +4)Marks	CO4	6
B)	Assess the complexities faced by valuers in identifying and quantifying obsolescence, and propose innovative strategies to address these challenges within the context of property valuation.	CO4	6
C)	A building having construction cost of Rs:15,000,00 has been constructed on a 200 m ² freehold land in metro city. The rate of land in the neighbourhood is Rs 2500/ m ² . The outstanding such as sinking fund and taxes collectively is Rs:30000/annum. Determine the net rent of the property considering 9% cost of construction and 6% of the cost of land. 1. Determine gross rent of the property after considering the outgoing (annually and monthly).	CO4	6

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Winter Examination-2023

Course: B. Tech.

Branch : Civil Engineering

Semester : 7th

Subject Name: Applied Hydrology & Flood Control

Subject Code : BTCVE705G

Max Marks: 60

Date:11-01-24

Duration: 3 Hr.

Instructions to the Students:

1. *All the questions are compulsory.*
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	(Level/CO)	Marks
Q. 1 Solve Any Two of the following.		12
A) Explain the types of precipitation.	CO1	6
B) Explain the concept of mass rainfall curves in hydrology. Discuss three practical applications of mass rainfall curves in hydrological studies.	CO1	6
C) Using the data given below, estimate the average precipitation using Thiessen Polygon method.	CO1	6

Stations	Area (Km ²)	Precipitation (mm)
A	72	90
B	34	110
C	76	105
D	40	150
E	76	160
F	92	140
G	46	130
H	40	135
I	86	95
J	6	70

Q.2 Solve Any Two of the following.		12
A) Discuss the key factors that influence the amount and rate of runoff in a watershed.	CO4	6
B) Explain the methods are commonly used for base flow separation in hydrological analysis?	CO4	6
C) Explain the concept of a unit hydrograph. Discuss any three limitations of Unit Hydrograph.	CO4	6

Q. 3 Solve Any Two of the following.		12
A) Discuss the significance of the hyetograph in hydrological analysis, especially in the context of stormwater management.	CO1	6
B) Define peak discharge and explain how it is determined during a flood event.	CO1	6
C) What are the various types of floods? Mention any three key factors that influence the occurrence of floods.	CO1	6
Q.4 Solve Any Two of the following.		12
A) Define flood routing in the context of hydrology and explain its purpose.	CO2	6
B) Differentiate between hydrologic and hydraulic flood routing.	CO2	6
C) I. Describe the Muskingum method for flood routing. (4 marks)	CO2	6
II. For routing of flood in a given channel using the Muskingum method, two of the routing coefficients are estimated as $C_0 = -0.25$ and $C_1 = 0.55$. Determine the value of the third coefficient C_2 . (2 marks)		
Q. 5 Solve Any Two of the following.		12
A) Explain the concepts of structural and non-structural measures in flood management, with a focus on floodplain zoning.	CO2	6
B) Examine the role of remote sensing in flood management, highlighting its applications, advantages.	CO2	6
C) I. Provide a concise definition of empirical techniques in the context of runoff estimation. (2 marks)	CO4	6
II. Consider a small urban catchment with an area of 50 hectares. The annual rainfall data for the catchment over the past five years is as follows: $R = [800, 850, 900, 820, 870]$ mm/year.		
Using the Rational Method, estimate the peak runoff for a design storm with an intensity of 40 mm/hour and a duration of 1 hour. Assume the runoff coefficient for the catchment is 0.65. (4 marks)		

***** End *****