

(Roll No. to be filled by candidate)

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**B. TECH.****FIFTH SEMESTER THEORY EXAMINATION, 2022 – 23****KCE – 501****GEOTECHNICAL ENGINEERING**

Time: 03 Hours

Max. Marks: 100

Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably. Illustrate the answers with suitable sketches.

1. Attempt any ***FOUR*** parts of the following: **4×5**
- Explain the significance of the structure of clay mineral as **CO1** constituents of engineering soils.
  - Explain the principle behind the hydrometer analysis. Also **CO1** illuminate the corrections applied to the hydrometer readings.
  - The Liquid Limit & Plastic Limit of soils is 65% and 31% **CO1** respectively, the Natural water content is 25%. Find the liquidity index and activity number.
  - The following data were obtained from a specific gravity test **CO1** performed in the laboratory:

Weight of empty pycnometer	=	201.25 gm
Weight of pycnometer and dry soil	=	298.76 gm
Weight of pycnometer, soil and water	=	758.92 gm
Weight of pycnometer full of water	=	698.15 gm

Determine the specific gravity of the soil.

- An embankment was constructed with a clayey soil at a **CO1** moisture content of 12%. Just after construction, the degree of saturation of the soil was found to be 55%. The soil absorbed water during the monsoon and its degree of saturation increased to 90%. Determine the water content of the soil at this stage. What will be the degree of saturation if the moisture content reduces to 5% in the dry season? Given  $G = 2.68$ .

CO1

- f. The results of a liquid limit test are given below:

No. of Blows	48	38	29	20	14
Water Content (%)	32.1	35.9	40.7	46.1	52.8

Determine the liquid limit of soil.

2. Attempt any **FOUR** parts of the following:

4×5

CO2

- a. In the experimental set-up shown in Figure 1, if the area of cross section of the soil sample be  $0.28 \text{ m}^2$ , and the quantity of water flowing through it be  $0.03 \text{ cm}^3/\text{sec}$ , determine the coefficient of permeability in m/day.

(5)

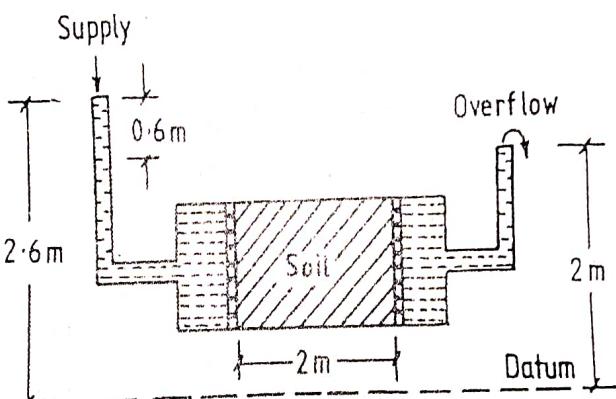


Figure 1

- b. Discuss about the various factors, those affect the permeability of soil.

CO2

- c. Explain the two conditions;  $k_1 > k_2$  and  $k_1 < k_2$  with the help of neat sketches for two types of soils having the different permeability  $k_1$  and  $k_2$ .

CO2

- d. A homogeneous earth dam, 30 m high, has a free board of 1.5 m. A flownet was constructed and the following results were noted: no. of potential drops = 12 and no. of flow channels = 3. The dam has an 18 m long horizontal filter at its downstream end. Calculate the seepage loss across the dam per day if the width of the dam is 200 m and the co-efficient of permeability of the soil is  $3.55 \times 10^{-4} \text{ cm/sec}$ .

CO2

- e. The void ratio of a sand sample at the loosest and densest possible states is found to be 0.55 and 0.98 respectively. If the specific gravity of soil solids be 2.67, determine the corresponding values of the critical hydraulic gradient.

(5)

- f. As an engineer for the design of a filter, the proper selection of filter material is required. So what are the conditions you should kept in your mind. CO2

3. Attempt any **TWO** parts of the following: 2×10

- a. Let us suppose as a geotechnical expert, you have a challenge to control the compaction in a site. So, how will you control the compaction by the Proctor's needle method? CO3

The in situ void ratio of a granular soil deposit is 0.50. The maximum and minimum void ratios of the soil were determined to be 0.75 and 0.35.  $G_s = 2.67$ . Determine the relative density and relative compaction of the deposit. (S)

- b. How will you find the coefficient of consolidation by the following two methods? CO3

- i. Logarithm of Time Method ✓  
ii. Square Root of Time Method ✓

- c. The consolidation settlement of a new structure founded on a 5 m thick layer is estimated as 6.5 cm. The structure was found to have settled by 1.6 cm in 6 months after the completion of construction. If the clay layer is underlain by rock and overlain by a layer of coarse sand, determine: CO3

- i. The time required for 50% consolidation to occur ✓  
ii. The amount of settlement which will take place in the next 6 months ✓

4. Attempt any **TWO** parts of the following: 2×10

- a. The plan of a uniformly loaded rectangular area is shown in Figure 2. Determine the vertical stress increases,  $\Delta\sigma$ , below point A' at a depth  $z = 4 \text{ m}$ . (Use the Influence Factor diagram) CO4

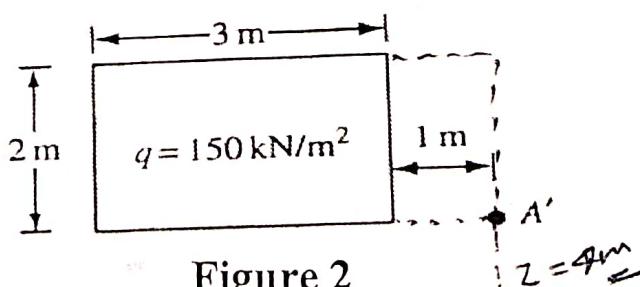


Figure 2  $z = 4 \text{ m}$

- b. For two stages (consolidation and shearing) of CD and CU test, show and explain the behavior of different possible curves for two different soil conditions (loose sand or normally consolidated clay, and dense sand or over consolidated clay). CO4

- c. The subsoil at a site consists of a 10 m thick homogeneous layer of dense sand having the following properties:  $\gamma_d = 16.2 \text{ kN/m}^3$ ;  $G = 2.68$  and  $\phi = 35^\circ$ . The natural ground water table lies at 2 m below the ground surface. CO4

- Determine the shear strength of the soil along a horizontal plane through the middle of sand layer.*
- If during monsoon, the water table rises to the ground level, how will the shear strength along the same plane change?*

Assume that the soil is dry above water table.

5. Attempt any **TWO** parts of the following: **2x10**

- a. For a clay backfill behind a retaining wall, what is the depth of tension crack? How is the total active earth pressure calculated for this backfill condition? CO5

- b. A 5 m high rigid retaining wall has to retain a backfill of dry, cohesionless soil having the following properties:  $\phi = 30^\circ$ ,  $e = 0.74$ ,  $G = 2.68$  and  $\mu = 0.36$ . CO5

- Plot the distribution of lateral earth pressure on the wall.*
- Determine the magnitude and point of application of the resultant thrust.*
- Compute the percent change in the lateral thrust if the water table rises from a great depth to the top of the backfill.*

- c. What is the Culmann's method of the stability analysis of finite slopes? Discuss in brief. CO5

An embankment of height 10 m high is inclined at  $35^\circ$  to the horizontal. A stability analysis by method of slices gave the following forces: Total Normal Force = 900 kN, Total Tangential Force = 420 kN, Total Neutral Force = 200 kN. If the length of the failure arc is 23 m, find the factor of safety with respect to shear strength. The soil has  $c = 20 \text{ kN/m}^2$  and  $\phi = 15^\circ$ .

(Following Roll No. to be filled by candidate)

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**B. TECH.****FIFTH SEMESTER THEORY EXAMINATION, 2022-23**  
**KCE-502****STRUCTURAL ANALYSIS****Time: 3 Hours****Max. Marks: 100****Note:**

- Attempt all questions. Assume any missing data suitably.

**a. Attempt any TWO parts of the following : [2 × 10] [ CO1 ]**

a. What do you understand by Static Indeterminacy of structures? Explain with examples how external and internal indeterminacy are determined in trusses and rigid frames.

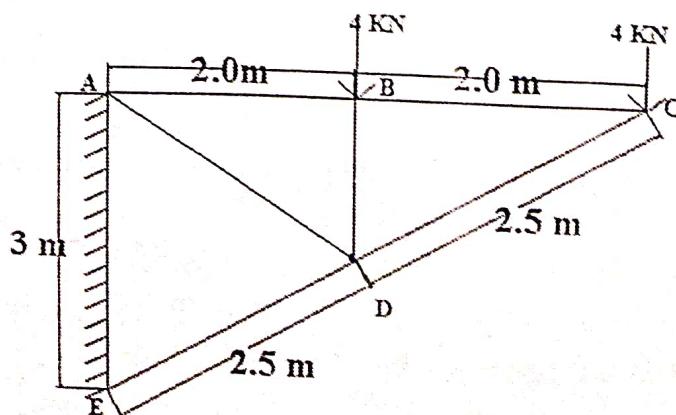
b. A suspension cable of span  $l$  and rise  $h$  is supported at same level. Derive the expression of the shape of the cable and length of the cable subjected to uniformly distributed load over the span.

c. A suspension cable of horizontal span 95 m is supported at two different levels. The right support is higher than the left support by 4 m. The dip to the lowest point of cable below the left support is 5 m. The cross sectional area of the cable is  $3500 \text{ mm}^2$ . Find the uniformly distributed load that can be carried by the cable if the maximum stress limited to  $600 \text{ N/mm}^2$ .

**b. Attempt any TWO parts of the following : [2 × 10] [ CO2 ]**

a. How are trusses classified? What do you understand by zero force members in trusses? Explain with suitable examples.

b. Using the method of tension coefficients analyze the cantilever truss shown below.

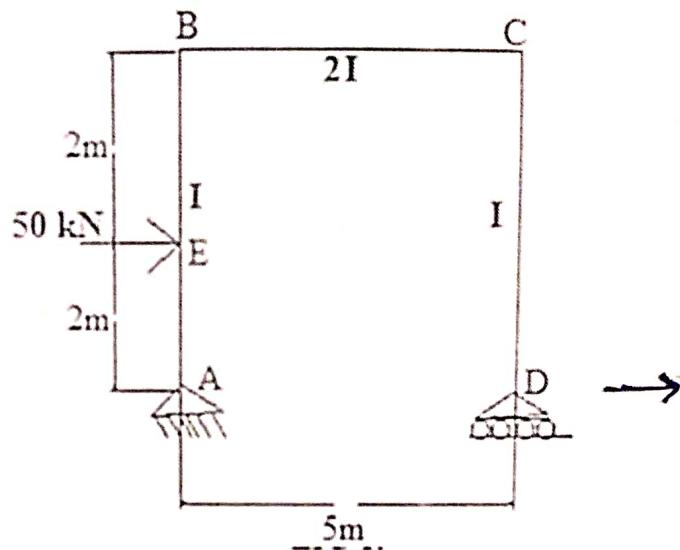


c. Explain with suitable example the method of substitute member to analyze a complex truss.

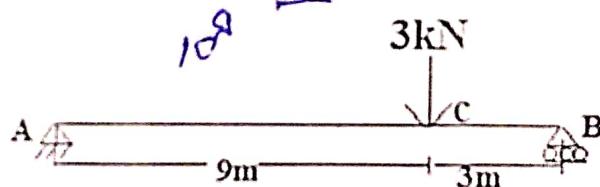
**3. Attempt any TWO parts of the following:**

[2×10][CO3]

- a. State and prove Castigliano's theorems.
- b. Determine the horizontal displacement of joint D of the frame shown below. Take  $I = 300 \times 10^{-6} \text{ m}^4$  and  $E = 200 \text{ GPa}$ .



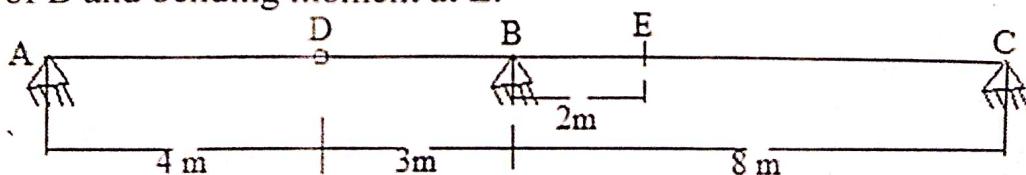
~~c.~~ Determine the maximum deflection of the beam shown in fig below by conjugate beam method.  $E = 200 \text{ GPa}$ ,  $I = 6000 \text{ cm}^4$



**4. Attempt any TWO parts of the following:**

[2×10] [CO4]

- a. A beam ABC is supported at A, B, C and has internal hinge at D as shown in the following fig. Draw influence lines for shear to the right of B and bending moment at E.



- ~~b.~~ Find the maximum bending moment, maximum positive and negative shear force at a section 8 m from left support A of a simply supported girder AB of 30 m span when 4 wheel loads 8 kN, 15 kN, 15 kN, 10 kN having centre to centre spacing at 2m between consecutive loads traverse the span from left to right with 10 kN load leading.

c. Find (i) the absolute maximum bending moment (ii) the absolute maximum positive and negative shear force in a simply supported girder of span 18 m, when a train of 4 wheel loads of 10 kN, 80KN, 60kN and 80kN with 10 kN load leading and spacing between loads as 3m, 2m and 2m respectively cross the girder from left to right.

5. Attempt any TWO parts of the following: [2×10][CO5]

a. The equation of the axis of a three hinged arch is  $y = x - (x^2 / 12)$ , the origin being the left hand support. The span and rise of arch are 12m and 3m respectively. The left half of the arch is loaded with a uniformly distributed load of 30 kN/m. Find (i) the reactions at the supports and (ii) Moment, radial shear and normal thrust at a section 3m from left support.

b. A three hinged circular arch has a horizontal span of 25 m with central rise of 5m. The arch carries a load of 10 kN at a distance 7.5 m from the left hand hinge .Find the horizontal thrust, reactions at supports and bending moments under the load.

c. A three hinged parabolic arch has a horizontal span of 40 m has abutments at unequal levels. The highest point of the arch is 5m above left and 3m above the right abutment. The arch is subjected to an udl of 30 kN/m over the portion left of the crown. Find the horizontal thrust and bending moment at a point 15 m from the left support.

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B. TECH.

FIFTH SEMESTER THEORY EXAMINATION, 2022-23

KCE-503

**QUANTITY ESTIMATION AND CONSTRUCTION  
MANAGEMENT**

Time: 03 Hours

Max. Marks: 100

Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1. Attempt any TWO parts of the following: 2×10 CO1

a. What is Estimation and it's purpose? Also describe about the types of estimation in details. Describe about the long wall short wall method and center line method of estimation.? CO1

b. Prepare the rough estimate for a proposed hospital building for the following data. CO1

Carpet area =  $600\text{m}^2/\text{floor}$ , Height of each storey=3.5m

No. of story's = G+3

Cubical content rate = Rs.  $1000/\text{m}^3$

Provided for a following as a percentage of structured cost

- Water supply & Sanitary arrangement -8%
- Electrification -6%
- Fluctuation of rates-5%
- Petty supervision & contingencies-3%

c. Explain following technical terms. CO1

- Supplementary Estimate
- Specifications
- Technical Sanction
- Site Plan
- Lump sum Items
- Supplementary Plan
- Plinth Area
- Detailed Estimate

2. Attempt any TWO parts of the following: 2×10 CO2
- a.  Workout the quantity of dry material and cost of material and labour for 1<sup>st</sup> class brickwork in 1:6(C:S) mortar ratio. Length of wall is 25m, Height is 3.5m & thickness of wall 300mm. What is contract and types of contract? Discuss their relative advantages and disadvantages CO2
- b. Explain in detail about Specification also write about detailed and general specification with examples. CO2
- c.  Analysis of rates for 150mm thick RCC slab in M20 ratio and Size and size of slab is 10m x10m. Workout the quantity of dry material & Cost of material and labor for RCC work. Also describe about the Tender and elements. CO2

3. Attempt any TWO parts of the following: 2×10 CO3
- a. What is project management and their elements. Also describe in brief, about Network, Elements and Errors in the network? CO3

b.

Activity	Predecessors	Duration(Weeks)			CO3
		O	M	P	
A	-	5	6	7	
B	-	1	3	5	
C	-	1	4	7	
D	A	1	2	3	
E	B	1	2	9	
F	C	1	5	9	
G	C	2	2	8	
H	E,F	4	4	10	
I	D	2	5	8	
J	H,G	2	2	8	

- i. Construct the network diagram.
- ii. Compute the earliest event time and latest event time.
- iii. Determine the critical path and total project duration.
- iv. Compute total and free float for each activity.

c.

Activity	$t_o$	$t_m$	$T_p$
1-2	1	1	7
1-3	1	4	7

CO3

1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- i. Draw the project network.
- ii. Calculate the expected duration and variance of the project length.
- ✓ iii. Determine the expected project completion time and draw the critical path.

4. Attempt any TWO parts of the following: 2×10 CO4
- a. Explain in detail about various construction equipment. CO4
  - b. Describe about various concreting equipment. CO4
  - c. Explain in detail about Dumpers, Drop Hammers and Diesel Hammers. CO4
5. Attempt any TWO parts of the following: 2×10 CO5
- (10) ✓ a. What is Break Even Analysis? Describe break even chart and its functions and limitations. CO5
- (1t) b. Explain depreciation and its types. Also write the definitions of Salvage value, Scrap value, Depletion and Book value. CO5
- c. What is cash flow diagram and also describe about Cost slope? CO5  
Also discuss about the Cost planning, Direct Cost, Indirect cost, Total Cost Curve.

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B. TECH.

THIRD SEMESTER THEORY EXAMINATION, 2022-23

KCE 051

CONCRETE TECHNOLOGY

Time: 03 Hours

Max. Marks: 100

Note:

Attempt all questions. All questions carry equal marks.

1. Attempt any **FOUR** parts of the following: 4×5 CO
- In what way does Portland cement differ from rapid hardening cement and high Alumina cement? What is the cause of main difference in their properties?
  - What is the effect of tri calcium silicate and di-calcium silicate and tri-calcium aluminate on the properties of cement?
  - Discuss the significance of testing of initial setting time of cement. Discuss the procedure of the test.
  - Write a short note on "Heat of Hydration". What do you mean by normal consistency of cement paste?
  - List the properties of fine aggregate and explain one of them in detail. Write the procedure to determine impact value of coarse aggregates.
  - Explain the importance of quality of water used in cement-concrete. What is the effect of Water-cement ratio in cement-concrete?
2. Attempt any **TWO** parts of the following: 2×10 CO

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- a. Explain the roll of admixtures in cement-concrete. What do you mean by 'accelerators', 'retarders', 'water reducers', 'air entrains', 'water proofer' and super plasticizers? CO2
- b. List various types of supplementary cementing materials. Also discuss the properties and effect of any three of such materials on concrete. CO2
- c. Write a short note on 'Durability' and 'Cleanliness' of concrete. CO2
3. Attempt any ~~FOUR~~ parts of the following: 4×5 CO
- a. Explain the use of re-cycled aggregate in making of concrete. CO3
- b. Describe the factors affecting the 'workability of concrete'. CO3  
Mention the laboratory tests to be conducted to ascertain the workability.
- c. Explain in brief (i) Bleeding (ii) Segregation (iii) Shrinkage (iv) Creep. CO3
- d. Explain the process of carbonation, freezing and thawing of concrete. CO3
- e. Discuss the procedure to conduct Compacting factor test in the laboratory with suitable sketches. What is 'self-compacting concrete'? CO3
- f. What is 'curing'? How does it affect the strength of concrete? CO3
4. Attempt any ~~TWO~~ parts of the following: 2×10 CO
- a. Explain the basic requirements which govern the proportioning of cement concrete and how are these CO4

achieved in practices?

b. Design the concrete mix for M30 grade of concrete using IS CO4 method with the following data:

- (i) Grade designation: M30
- (ii) Type of cement: OPC-43 grade
- (iii) Brand of cement: ACC
- (iv) Admixtures: Sikament 170H (Sika)
- (v) Fine Aggregate: Zone II
- (vi) SG of cement: 3.15
- (vii) SG of fine aggregate: 2.61
- (viii) SG of coarse aggregate (20 mm size): 2.65
- (ix) SG of coarse aggregate (10 mm size): 2.66
- (x) Minimum cement (as per contractor): 400 Kg/m<sup>3</sup>
- (xi) Maximum water-cement ratio (as per contractor): 0.45

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c. Design the concrete mix for M30 grade of concrete using ACI method with the same above data, as given in Question 4 (b).

Attempt any TWO parts of the following:

2x10 CO  
CO5

a. Explain

- (i) High volume fly ash concrete
- (ii) High strength concrete
- (iii) Fiber reinforced concrete
- (iv) Ready mix concrete

b. Explain

CO5

- (i) GGBS based concrete
- (ii) Ferro-cement Concrete
- (iii) High performance concrete
- (iv) Geo-polymer concrete

Total Number of Printed Pages: 04

KCE 051

COS

c Explain

- (i) Silica fume concrete
- (ii) Light weight concrete
- (iii) Temperature controlled concrete
- (v) Colored concrete

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**B. TECH.****FIFTH SEMESTER THEORY EXAMINATION, 2022-23****KCE-055****ENGINEERING HYDROLOGY****Time: 03 Hours****Max. Marks: 100**

Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1. Attempt any **FOUR** parts of the following: **4×5 CO**

a. Describe the hydrologic cycle with neat sketch CO1

b. Give details about various types of rain gauges used in CO1

India with their merits and demerits. CO1

c. Write the detail note on Water budget equation. CO1

d. Discuss in detail the various forms of precipitation also write a short note on convective and orographic precipitation. CO1

e. The maximum one day rainfall indicated that a depth of 280 mm had return period of 50 years. Determine the probability of a one day rainfall depth equal to or greater than 280 mm at this city occurring (i) Once in 20 successive years (ii) two times in 15 successive years and (iii) at least once in 20 successive years. CO1

f. Explain the procedure for supplementing the missing rainfall data. CO1

2. Attempt any **TWO** parts of the following: **2×10 CO**

a. A 6 h storm produced rainfall intensities of 7, 18, 25, 12, 10 and 3 mm/h in successive one hour intervals over a basin of 800 sq. km. The resulting runoff is observed to be 2640 hectare-metres. Determine  $\Phi_{\text{index}}$  for the basin. CO2

- b) The ordinates of a 12-h unit hydrograph are given. Determine CO<sub>2</sub> the ordinates of an S-curve hydrograph and using this determine the ordinates of 6-h unit hydrograph.

Time (h)	0	6	12	18	24	30	36	42	48	54	60	66
12-h UH	0	10	37	76	111	136	150	153	146	130	114	99
Ordinate (m <sup>3</sup> /s)	.											

- c. Write detail note on *any two*:

- (i) Method of superposition (ii) Instantaneous Unit Hydrograph (iii) Synthetic Unit Hydrograph

CO<sub>2</sub>

3. Attempt any *TWO* parts of the following:

2×10

CO

- a. Flood frequency computations for the river Chambal at Gandhisagar dam by using Gumbel's method, yielded following results

Return Period T(years)	Peak Flood m <sup>3</sup> /s
50	40,809
100	46,300

29

Estimate the flood magnitude in this river with a return period of 500 years.

- b. Analysis of annual flood series of a river yielded a sample mean of 1000 m<sup>3</sup>/s and standard deviation of 5000 m<sup>3</sup>/s. Estimate the design flood of a structure on this river to provide 90% assurance that the structure will not fail in next 50 years. Use Gumbel's method and assume the sample size to be very large.
- c. Describe the numerical method of hydrologic reservoir routing.

CO<sub>3</sub>CO<sub>3</sub>CO<sub>3</sub>CO<sub>3</sub>

4. Attempt any *TWO* parts of the following:

2×10

CO

CO<sub>4</sub>

- A-45 cm well in unconfined aquifer of saturated thickness of 45 m yields 600 lpm under a drawdown of 3.0 m at the pumping well (a) What will be the discharge under a drawdown of 6.0 m? (b) What will be the discharge in a 30-cm well under a drawdown of 3.0 m. Assume radius of

20

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influence to remain constant at 500 m in both cases.

- b. Develop an equation relating the steady state discharge from a well in an unconfined aquifer and depths of water table at two known positions from the well. State clearly all the assumption involved in your derivation. CO4
- c. Write the short note on: (i) Multiple Well System (ii) Image Wells (iii) Mutual Interference of wells (iv) well loss and specific capacity CO4

5. Attempt any **TWO** parts of the following: 2x10 CO
- a. Write detail notes on Roof –top rain water harvesting. CO5
- b. Write the various ground water pollutants. What are the various methods to control the groundwater pollution? Discuss any two methods in detail. CO5
- c. (i)What is a well and how is it constructed? What are the methods of construction of a well? CO5
- (ii)What is well development? What are the objectives of well development?

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**B. TECH.****FIFTH SEMESTER THEORY EXAMINATION, 2022-23****KNC-502**

**INDIAN TRADITIONS, CULTURE AND SOCIETY/  
ESSENCE OF INDIAN TRADITIONAL CULTURE**

**Time: 02 Hours****Max. Marks: 50**

Note:

- Attempt all questions. All questions carry equal marks.
1. Attempt any **TWO** parts of the following: 2×5 CO
    - a. Give your views on gender justice in ancient India. Justify CO1 your response with the help of examples.
    - b. What are the four goals of human life in Indian culture and CO1 tradition? Explain each one of them. How are each one of them achieved? Are they relevant today?
    - c. How is Dharma defined in Indian culture? Explain how CO3 religion and Dharma are distinct ideas?
  2. Attempt any **TWO** parts of the following: 2×5 CO
    - a. What is meant by the word “UPANISHAD”? Explain the CO2 verse “EKAM SAD VIPRA BAHUDHA VADANTI”.
    - b. Give names of some of the Purans. How many of them are CO2 there? Explain how India has been defined in Vishnu Puran.
    - c. Quote and explain some well known verses prevalent from CO3 the ancient times which eloquently espouse for ideals such as -- Oneness of the whole world , wellbeing of all , unity of India , and pluralism.
  3. Attempt any **TWO** parts of the following: 2×5 CO  
CO3
    - a. Explain the eight fold path of The Buddha.

- b. Explain the essence of the teachings of Jainism. CO3
- c. Compare between Advaita Vedanta and Sufism. CO3
4. Attempt any *TWO* parts of the following: 2×5 CO  
a. Did people in ancient India understand the concepts of both CO4 linear and cyclic time? Elaborate.
- b. It is claimed that people in ancient India had trade links CO4 extending to distant regions of the world. Justify this claim indicating parts of the world with which India carried out trade activities.
- c. Elaborate how texts were written in ancient India. What was CO4 the status of writing technology in ancient times?
5. Attempt any *TWO* parts of the following: 2×5 CO  
a. Explain about the bronze image of Nataraja built in 12<sup>th</sup> CO5 century during Chola period .What spiritual meaning does this image convey. Is our world cosmic dance?
- b. How old are cave paintings in India? Describe any two CO5 famous cave paintings such as Bhimbetka , Ajanta and Ellora etc.
- c. Write a short note on Indian cinema beginning with the first CO5 feature film in 1913.

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**B. TECH.**

**SIXTH SEMESTER THEORY EXAMINATION, 2022-23**

**KCE-061**

**ADVANCE STRUCTURAL ANALYSIS**

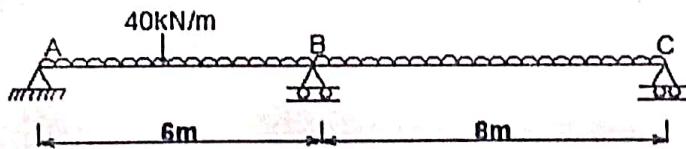
**Time: 03 Hours**

**Max. Marks: 100**

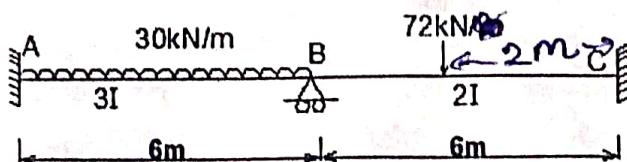
Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably. Illustrate the answers with suitable sketches.

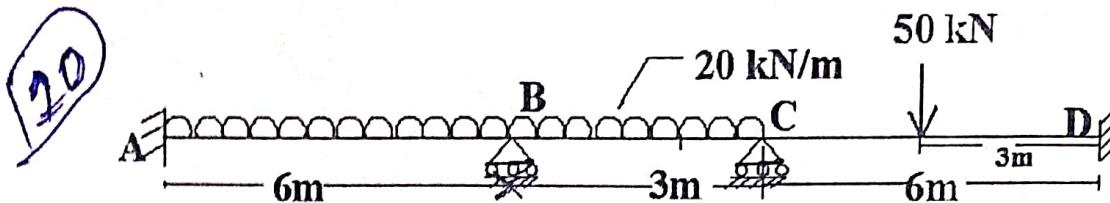
1. Attempt any **TWO** parts of the following: **2×10 CO**
- a. Analyse following beam by consistent deformation method: EI is CO1 consistent throughout.



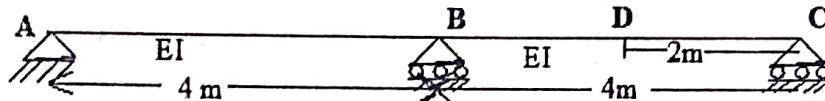
- b. Analyses the beam shown below by moment distribution method. CO1  
Draw S.F. & B.M. diagram.



- c. Analyse the continuous beam shown in fig below by slope deflection method. Draw bending moment diagram.



2. Attempt any **TWO** parts of the following: 2×10 CO
- Construct Influence line diagram for the shear force at point D CO2 of the beam shown in fig. below:



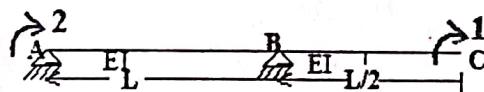
- b** A two hinged parabolic arch of span L and rise h carries u.d.l of w per meter run over the whole span Assuming  $I = I_0 \sec \alpha$ . Find the expressions for the horizontal thrust developed.
- Horizontal thrust
  - B.M. at distance x from left hinge
  - Radial shear & normal thrust at the section at a distance x from left hinge

3. Attempt any **TWO** parts of the following: 2×10 CO

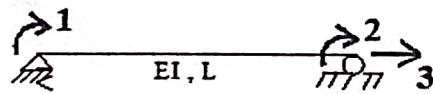
- A suspension cable of 100m span and 10m dip in stiffened by a three hinged stiffening girder. It is subjected to two point loads of 200kN and 300kN at a two point loads of 25m and 50m from the left end. Find the shear force and bending moment for the girder at a distance 30m from the left end. Find also the maximum tension in the cable.
- A suspension cable of 100m span has a dip of 10m. It is stiffened by a two hinged girder whose weight is 20kN/m. Determine the maximum tension in the cable of a point load

of 500kN rolls over the girder. Find also the maximum positive and negative BM on the girder.

- c. A suspension bridge has a cable of span 100 m and dip of CO3 10 m. The cable is stiffened by a three hinged stiffening girder. Sketch the influence line diagram for bending moment at quarter span of girder. Determine the maximum moment at this section when a uniformly distributed load longer the span of intensity 10 KN/m traverse the span.
4. Attempt any **TWO** parts of the following:  $2 \times 10$  CO
- F*
- a) Define and differentiate between flexibility coefficients and CO4 stiffness coefficients. Prove that the flexibility and stiffness matrices are inverse of each other.
- b) Generate flexibility matrix of the beam shown below for the CO4 coordinates indicated.

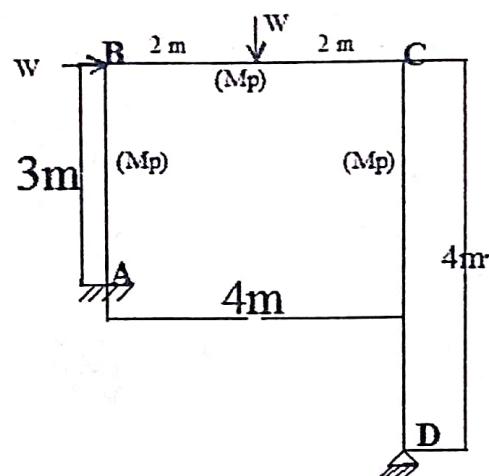


- c. Develop the stiffness matrix for the beam show below with CO4 respect to degree of freedom shown.



$K = \frac{P}{\delta}$   
 $P, K_{11}, \delta_1$

5. Attempt any **TWO** parts of the following:  $2 \times 10$  CO
- a. What is Plastic Hinge and Mechanism? Discuss various CO5 types of mechanisms. Explain: Static theorem, Kinematic theorem, Uniqueness theorem.
- 10* b. Derive the expression for shape factor of a typical CO5 rectangular beam and triangular section. *10*
- 10* c. Determine the collapse load  $W_c$  for the frame shown in fig CO5 below.



**(Roll No. to be filled by candidate)**

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**B. TECH.**  
**SIXTH SEMESTER THEORY EXAMINATION, 2022-23**  
**KCE-603**  
**ENVIRONMENTAL ENGINEERING**

**Time: 03 Hours****Max. Marks: 100****Note:**

- Attempt all questions. All questions carry equal marks.
1. Attempt any **FOUR** parts of the following:      **4×5**      CO
- a. What are allowances that should be made in India for loss CO1 and wastage in water supply? Give reasons.
  - b. What is per capita demand? How this is estimated? CO1
  - c. Mention and discuss the factor that influences per capita CO1 demand.
  - d. What is coincident draft? Also discuss the provision for fire CO1 demand in water supply.
- (10)
- e. Predict the population for the years 1981, 1991, 1994, and CO1 2001 from the following census figures of a town by incremental increase method.

Year	1901	1911	1921	1931	1941	1951	1961	1971
Population: (thousands)	35	46.6	99.4	156	162	171	180	192

2. Attempt any **TWO** parts of the following: 2×10 CO  
CO2
- a. A pipe network consists of following pipes.

Pipe	Length (m)	Diameter (cm)	Friction Factor
AB	400	30	0.014
BC	600	30	0.010
AD	500	40	0.012
DC	500	25	0.011

If flow at A is  $1.0 \text{ m}^3/\text{sec}$ , while outflows at B,C and D are  $0.3, 0.5$  and  $0.2 \text{ m}^3/\text{sec}$ , respectively, find the flow in each pipe taking only one trail. The pressure at A is 100 m of water.

- b i. Discuss different layouts for water distribution network with their advantages and disadvantages.
- ii. Discuss following methods of water distribution.

Gravitational System

Pumping System

Combined System

- c. A town with a population of 1 million has a continuous water supply. Average supply is 270 lpcd, the water being supplied by direct pumping. The total supply of 270 lpcd is phased as follows

Time	lpc
5AM to 11AM	90
11AM to 3PM	54
3PM to 9 PM	81
9PM to 1 AM	27
1AM to 5AM	18

Water is supplied from the treatment plant at a uniform rate of 11.25 million litres per hour, for all 24 hours. Find the capacity of the reservoir required for distribution of water.

3. Attempt any **FOUR** parts of the following:  $4 \times 5$  CO
- a. How hardness is measured in a laboratory? CO3
  - b. Discuss harmful effects of excess fluoride in water. CO3
  - c. The 5-day BOD of a wastewater is 190 mg/l. Determine ultimate oxygen demand. Assume  $k_1 = 0.25 \text{ day}^{-1}$  CO3
  - d. What is MPN? Discuss properties required for Indicator Organism. CO3
  - e. Differentiate between carbonaceous oxygen demand and nitrogenous oxygen demand with help of graph. CO3
  - f. What is Kjeldhal Nitrogen? CO3
4. Attempt any **FOUR** parts of the following:  $4 \times 5$  CO
- a. A spherical sand particle of diameter 0.05 mm is settling in a water medium with specific gravity of 1.8. Determine its terminal settling velocity at  $20^\circ\text{C}$ . Given that the kinematic viscosity of water at  $20^\circ\text{C}$  is  $1.04 \times 10^{-6} \text{ m}^2/\text{s}$ . CO4
  - b. What do you understand by unit operations and processes? Elaborate the various types of physical unit operations and chemical unit processes used for water treatment. CO4
  - c. Define (i) rapid mixing (ii) flocculation. Also discuss its significance. CO4
  - d. What is the principal cleaning mechanism in Backwashing filters? CO4
  - e. Draw a curve for break point chlorination. Also discuss various significant points in the curve. CO4
5. Attempt any **TWO** parts of the following:  $2 \times 10$  CO
- a. Define (i) Biomass (ii) lag phase (iii) log growth phase (iv) Suspended Culture (v) endogenous phase CO5

- b. (i) Discuss working process of trickling filter. — CO5  
(ii) Design a low rate filter to treat 6.0 Mld of sewage of BOD of 210 mg/l. The final BOD of effluent should be 30 mg/l and organic loading rate is  $320 \text{ g/m}^3/\text{d}$ .
- c. i. Explain working of oxidation pond and symbiotic relationship in it. Also write its kinetic equations for plug flow and complete mix reactors. CO5  
iii. Define following terms: Mean Cell Residence Time (MCRT), F/M ratio, bulking of sludge

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**B. TECH.****SIXTH SEMESTER THEORY EXAMINATION, 2022-23**

KNC-601

**CONSTITUTION OF INDIA, LAW & ENGINEERING****Time: 02 Hours****Max. Marks: 50**

Note:

- Attempt all questions. All questions carry equal marks.
1. Attempt any **TWO** parts of the following: 2x5 CO
    - a. Discuss preamble of constitution. What are the directive principles of state policy? CO1
    - b. Define federal system & centre - state relation as per Indian constitution. CO1
    - c. Write about emergency provision of constitution of India & explain various types of it with reference to time period of its implementation. CO1
  
  2. Attempt any **TWO** parts of the following: 2x5 CO
    - a. Explain procedure of amendment in constitution of India. CO2  
Describe judicial review & Public interest litigation.
    - b. What are the functions of high court & subordinate court? CO2
    - c. Elaborate Role & Function of President of India. Compare power of Indian president with US counterpart. CO2
  
  3. Attempt any **TWO** parts of the following: 2x5 CO
    - a. Explain term law. What do you understand by the term sources of law? CO3
    - b. Describe arbitration as an alternative to resolve disputes. CO3
    - c. Describe contract law, tort & law at workplace. CO3

4. Attempt any **TWO** parts of the following: 2×5 CO
- a.  Describe intellectual property law, patent filing & infringement procedure. CO4
  - b. Explain Right to Information act 2005, copyright law & cyber appellate tribunal. CO4
  - c.  What do you mean by term E-governance? Explain its application with suitable examples. CO4
5. Attempt any **TWO** parts of the following: 2×5 CO
- a. Differentiate between association & memorandum of association. CO5
  - b. What do you mean by sole trader? Write its advantages and disadvantages. CO5
  - c. Discuss formation & winding up procedure of different type of companies. Write short note on general meetings & proceedings. CO5

(Roll No. to be filled by candidate)

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**B. TECH.****FIFTH SEMESTER THEORY EXAMINATION, 2022-23****KCE-602****TRANSPORTATION ENGINEERING****Time: 03 Hours****Max. Marks: 100****Note:**

- Attempt all questions. Assume missing data suitably.

1. Attempt any **FOUR** parts of the following: **4×5 CO**
- What are the salient features of early Roman Roads? How do these differ from the present day road construction? **CO1**
  - A two lane NH is passing through a plain terrain. Calculate the length of transition curve with the given data and considering the radius of circular curve is equal to the minimum ruling radius. **CO1**

Design Speed = 100Kmph ✓ ✓

Rate of Super elevation = 1 in 150 ↗

Wheel base of Largest Truck = 6.1 m

Width of Pavement = 7.0 m ↘

- c. An ascending gradient of 1 in 100 meets a descending gradient of 1 in 120. A summit curve is to be designed for a speed of 80 kmph so as to have an overtaking sight distance of 470m. **CO2**

- d. Calculate the stopping sight distance for design speed of 80 kmph in rolling terrain at an ascending gradient of 3.0%. **CO2**

Take the total reaction time 2.5 seconds and coefficient of friction = 0.35.

- e. Explain with sketches the main features of various road patterns commonly in use. **CO1**

- f. Briefly explain the engineering surveys needed for locating a new highway. **CO1**

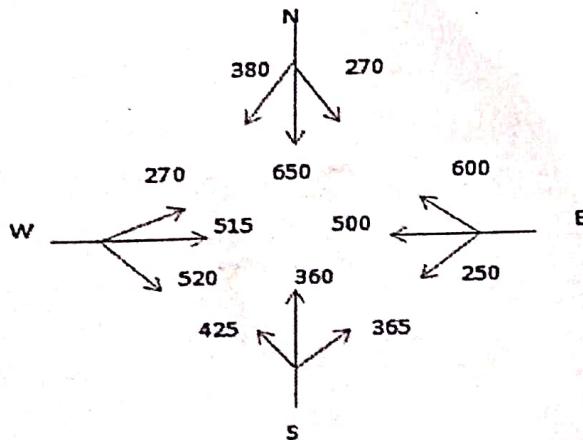
- 15) 2. Attempt any **TWO** parts of the following: 2×10 CO  
CO1
- a. The following data were collected for planning the road development program of a backward district. 10

- (i) Total Area=9600 km<sup>2</sup> (ii) Agricultural and developed area=3200 km<sup>2</sup> (III) Existing Railway track length=105 km (iv) Existing length of metalled road = 322 km (v) Existing length of unmetalled road = 450 km (vi) Number of towns or villages in different population ranges are as given below:

Population	>5000	2001-5000	1001-2000	501-1000	<500
No. of Villages and Towns	8	40	130	—	590

Calculate the additional lengths of metalled and unmetalled roads for the road system based on Nagpur Road Plan formulae for this district.

- b. Explain PIEV theory. Enumerate the steps for practical design of super elevation? CO2
- c. Derive the expression for finding the stopping sight distance at level and at grades. CO2
3. Attempt any **TWO** parts of the following: 2×10 CO  
CO3
- a. The width of a carriage way approaching an intersection is given as 15 m. The entry and exit width at the rotary is 12 m. The traffic approaching the intersection from four sides is shown in Fig. Find the capacity of rotary using given data.



- 10** b. Discuss briefly the classification of traffic signs and signals CO3 according to Indian Motor Vehicle Act. Give two examples of each with neat sketch for each classification.
- c. (1) Write the short note on the following CO3  
 (i) Thirtieth highest hourly volume (ii) Desire Lines  
 (2) Discuss in detail the passenger Car Unit (PCU).

- 20** 4. Attempt any **TWO** parts of the following: 2×10 CO  
 a. Soil subgrade obtained with the following properties CO4

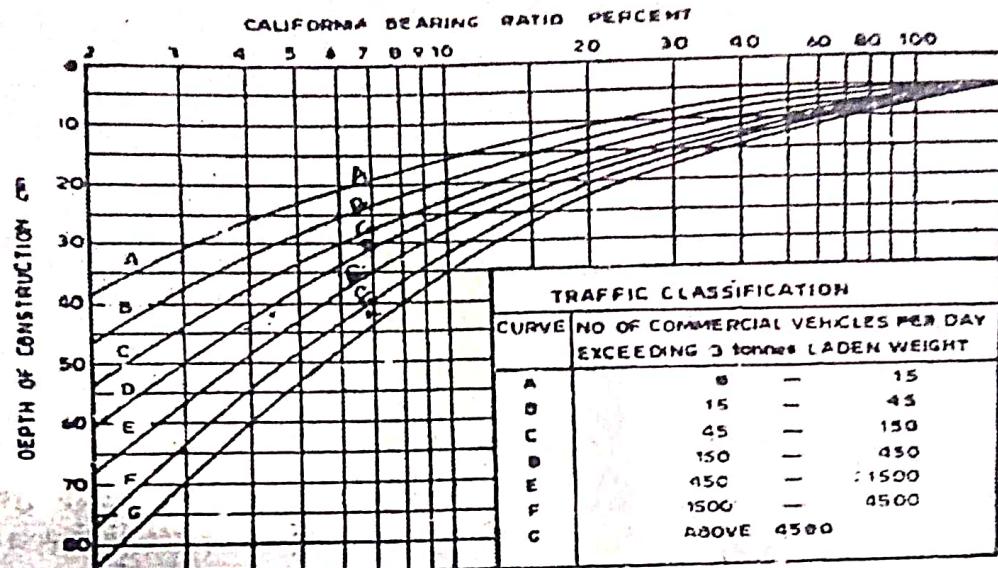
**10**

Penetration (mm)	Load	Penetration (mm)	Load
0.0	0	3.0	56.5
0.5	5.0	4.0	67.5
1.0	16.2	5.0	75.2
1.5	28.1	7.5	89.0
2.0	40.0	10.0	99.5
2.5	48.5	12.5	106.5

It is desired to use the following materials for different pavement layers

- Compacted sandy soil with 7% CBR
  - Poorly graded gravel with 20 % CBR
  - Well graded gravel with 95% CBR
  - Min. thickness of bituminous concrete surfacing =5 cm
- Present ADT commercial vehicle= 1300

The annual rate of growth=8% and the pavement construction is to be completed in 4 years. The present ADT of commercial traffic=1200. Design the pavement section by CBR method of pavement design in the light of the above results.



b. The properties of subgrade soil are given below:

CO4

Passing 0.074 mm sieve = 60%

Liquid Limit = 55%   Plastic Limit = 45%

Discuss the suitability of the soil as a subgrade material.

Calculate The GI Value for heavy traffic with over 400 commercial vehicles per day.

c. Calculate the stresses at interior, edge and corner of a cement concrete pavement by Westergaard's stress equations

~~10~~  
Modulus of elasticity of concrete =  $3.0 \times 10^5$  kg/cm<sup>2</sup>

Poison ratio for concrete = 0.15

Thickness of concrete pavement = 18 cm

Modulus of subgrade reaction = 8.5 kg/cm<sup>2</sup>

Wheel load = 5100 kg

Radius of loaded area = 15 cm

5. Attempt any **TWO** parts of the following:

2x10 CO

a. Explain the Construction procedure of Bituminous Concrete.

CO5

b. Write the detail note on Marshall test for Job Mix Design for flexible Pavement.

CO5

c. Write the short notes of the following:

CO5

- (i) Seal coat
- (ii) Sheet asphalt
- (iii) Mastic asphalt
- (iv) Bituminous Concrete

(Roll No. to be filled by candidate)

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B. TECH.

SIXTH SEMESTER THEORY EXAMINATION, 2022-23

KOE-066

GIS AND REMOTE SENSING

Time: 03 Hours

Max. Marks: 100

Note:

- Attempt all questions. All questions carry equal marks.

1. Attempt any **TWO** parts of the following:  $2 \times 10$  CO

10 a. What is Remote Sensing and it's principles, also describe about the Remote Sensing Platforms? CO1 ①

b. Write down about the Characteristics of Real Remote sensing system and advantages and disadvantages of Remote Sensing? CO1

10 c. Explain in detail Electro-Magnetic Radiation Spectrum? CO1 ②

2. Attempt any **TWO** parts of the following:  $2 \times 10$  CO

10 a. What is Sensors and sensor Platforms, also write down types of sensor platforms? CO2 ③

b. Write down about the Stereoscopic Coverage in detail? CO2

10 c. Explain in details Photo interpretation and elements of Aerial photo interpretation? CO2 ④

3. Attempt any **TWO** parts of the following: 2×10 CO

- a. Write down about Photogrammetry and it's classification. (8) CO3  
b. What is Parallax theorem in Photogrammetry? CO3  
c. Explain Image Classification in Remote Sensing, CO3  
Unsupervised classification and Supervised classification?

4. Attempt any **TWO** parts of the following: 2×10 CO

- (10) a. Explain in brief about Microwave remote sensing and it's Component? CO4 (5)  
b. What is Radar Operating Principle? CO4  
c. Explain-  
a. Incidence Angle (6)  
b. Look Angle  
c. Depression Angle  
d. Azimuth Angle

5. Attempt any **TWO** parts of the following: 2×10 CO

- (10) a. What is Spatial Data and it's types? (7) CO5  
b. Describe about the methods of data input into GIS? CO5  
c. Write down about the application of Remote sensing and CO5  
GIS for the land and water resources? (2)

(Roll No. to be filled by candidate)											

**B. TECH.**  
**SIXTH SEMESTER THEORY EXAMINATION, 2022-23**  
**KCE -601**  
**DESIGN OF CONCRETE STRUCTURES**

**Time: 03 Hours****Max. Marks: 100**

Note:-

- Attempt all questions. Assume ~~m: column~~ 'a suit' ~~ed to uniaxial compression~~ if not mentioned
- Use of IS 456 , IS SP 16,
- Assume the grade of steel ~~as per code~~ if not mentioned

1. Attempt any **TWO** parts of the following:      **2×10 CO**
  - a. Illustrate the various exposure conditions with their requirement also describe the stress strain behavior of concrete under compressive loading.      **CO1**
  - b. Check the safety of a Rectangular cantilever beam of 300 x 400 mm which is reinforced with the 4-20 mm bar at top with a clear cover of 30 mm and 10 mm stirrups. Beam is subject to a service moment of 165kN-m. Use M20 and Fe415.      **CO1**
  - c. Design a beam section for sagging moment in a hall having effective span of 4.2 m internal moment in beam at each one meter from left ends are -150 kN-m , +140 kN-m, +170kN-m & -175kN-m respectively . Use M25 and Fe 415      **CO1**
2. Attempt any **TWO** parts of the following:      **2×10 CO**
  - a. Design the Development length for bars for continuous beam with following detail : effective span = 3.8.0 m, beam size 300 mm x 450 mm reinforced with 2-16mm and 2-20

mm bar at bottom and 2-12 bar at top throughout the length, factored loading 40 kN/m including all weight.

- b. Illustrate the behavior difference of shear reinforced CO2 concrete beam and shear unreinforced concrete beam w.r.t. cracking and failure pattern. Also describe the effect of flexure reinforcement on shear capacity of beam.
- c. A simply supported beam 300 mm x 500 mm effective are CO2 reinforced with 2 bars of 20 mm dia bar and 2 bars of 16 mm dia. It carries a uniformly distributed load of 45kN/m over an effective span of 6m. If this 2-16 bars are can be removed from the beam, what will be the supports. Design the shear reinforcement for the beam. Use M 20 grade concrete and Fe 415 steel. Draw detailing
3. Attempt any **TWO** parts of the following: 2x10 CO
- a. Design a RCC slab for a room size 3m x 4m. Center to center of support. The corners of the slab are held down. Use Live load on the slab as 4kN/m<sup>2</sup>, M20 grade concrete and Fe415 steel. Draw neat reinforcement sketch. CO3
- b. Design the continuous R.C.C slab for the hall 3 x 13.5m effective. The slab is supported on three beams each of 300mm wide and is equally placed. The end of slab supported on 300mm brick wall. The slab carry L.L=3.5 KN/m<sup>2</sup> and floor finish = 1.5 kN/m<sup>2</sup>. Use M20 grade concrete and Fe415 steel. Draw the reinforcement details CO3
- c. Write short notes on following CO3
- i) Secondary reinforcement in slab
  - ii) Reinforcement detailing of corner in two way slab

4. Attempt any **TWO** parts of the following: 2x10 CO
- a. Estimate the safe load capacity of a spiral column of effective length 3.5 meter with gross diameter of 500 mm is reinforced with 8-20 mm bar. Diameter of spiral is 8 mm CO4

with spacing of 40 mm. take clear cover as 50 mm. Use M25 and Fe415.

- b. Design the short axially loaded column of size 420 mm x CO4 600 mm and having 3 m unsupported length of column .The column is subjected to axial load of 2000 KN and is effectively held in position but not restrained against rotation at both ends. Use M20 and Fe415 Steel. Also draw the reinforcement details.
- c. Describe the steps to develop the interaction curve for CO4 column and check the safety of column subjected to uniaxial bending.
5. Attempt any **TWO** parts of the following: 2×10 CO
- a. Determine the dimension of footing for axially loaded CO5 column of 500mm x500 mm in size transmitting a load of 1500 kN assume SBC of soil  $250 \text{ kN/m}^2$  .Use M25 grade of concrete and Fe415. Take the thickness of footing as 750 mm. depth of foundation is 1.5 meter and density of soil is  $18 \text{ kN/m}^3$ .Also check the safety against bearing.
- b. Explain the different type of footing used for the foundation CO5 with diagram and their safety checks. Also describe the critical section in footing with neat sketch.
- c. Determine the preliminary size & Apply check for Stability CO5 against sliding and overturning for the cantilever retaining wall to retain soil of following data angle of internal friction  $35^\circ$ . SBC of soil is  $200 \text{ kN/m}^2$  and Density of soil is  $18 \text{ kN/m}^3$ . Friction coefficient between soil and concrete is 0.55.