Vidya Academy of Science & Technology Technical Campus

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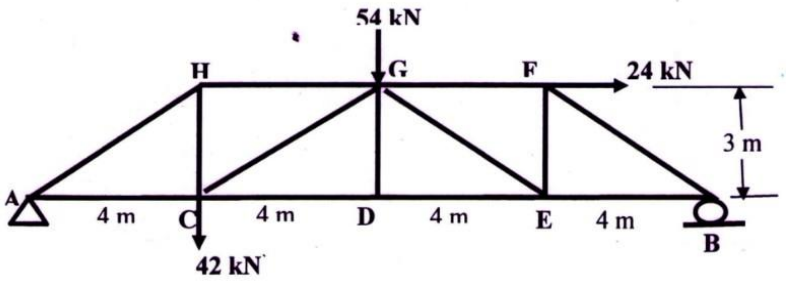
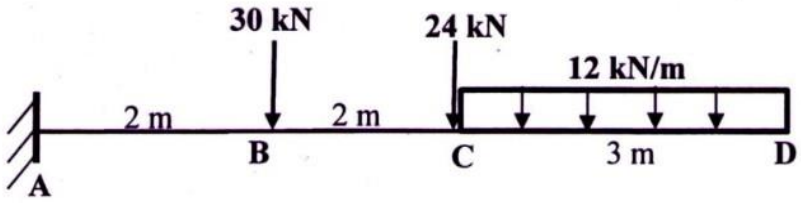
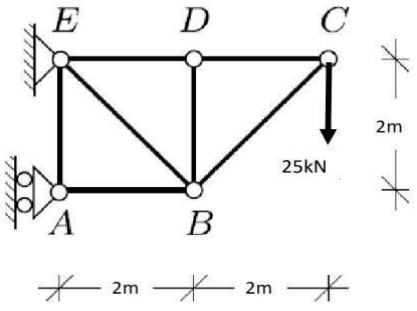
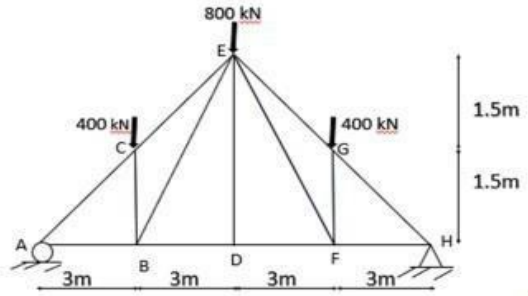
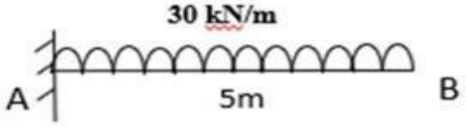
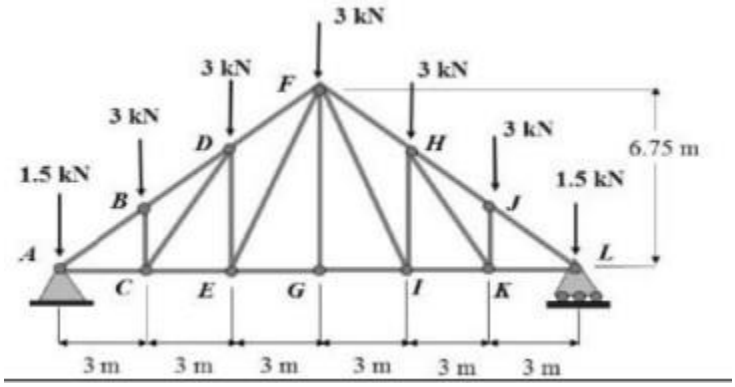
"A Unit of Vidya International Charitable Trust"

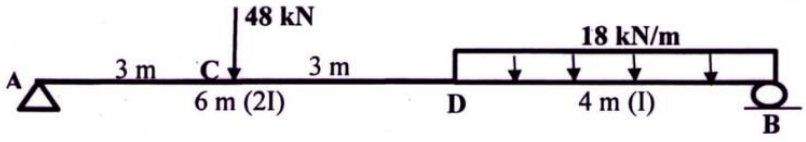
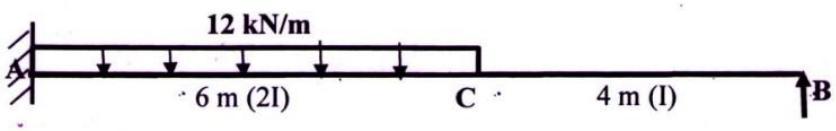
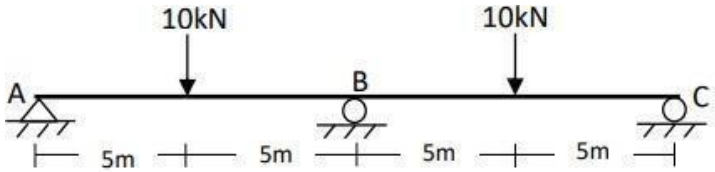
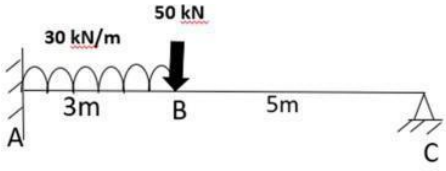
QUESTION BANK
SEMESTER- 5

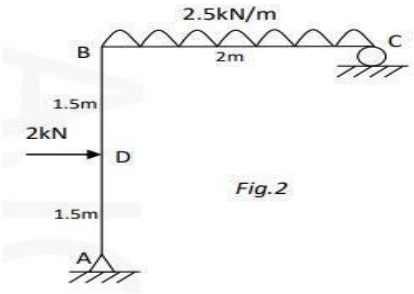
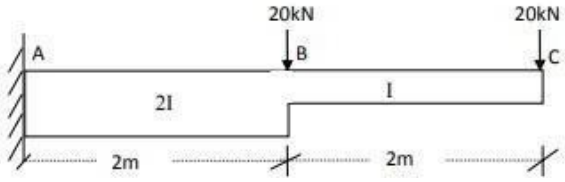
CET301 - STRUCTURAL ANALYSIS – I
(QUESTION BANK)

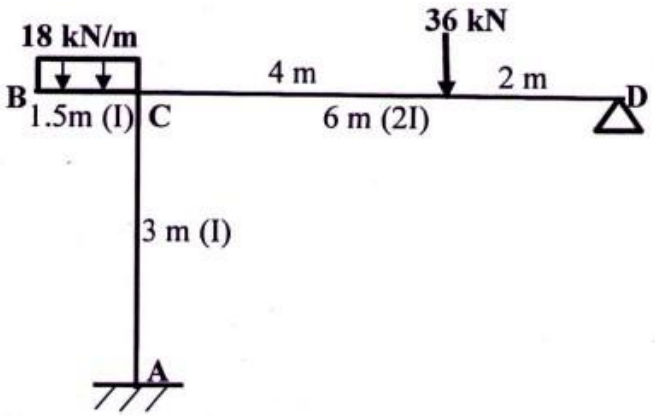
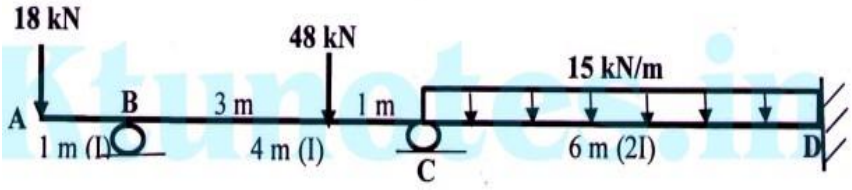
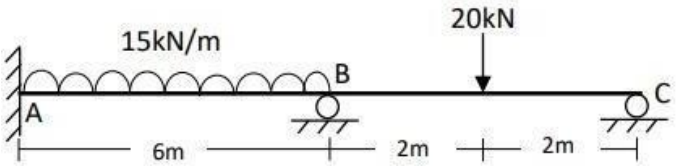
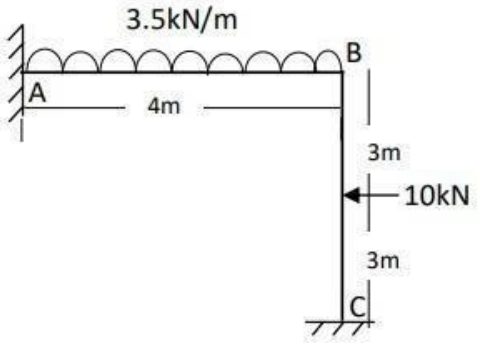
Module – 1

Sl.No.	Question	Marks	Question Paper
1.	Figure shows a loaded truss of span 16 m. Determine the support reactions, analyze using the method of joints and tabulate the forces in all the members. 	14	DEC 2023
2.	Figure shows a loaded cantilever beam of span 7 m. Compute the deflections at B, C & D and slope at D using the moment area method. E = 200 GPa and I = $120X10^6$ mm^4.+ 		
3.	A simply supported beam AB of span 4.2m supports a uniformly distributed load of 10kN/m over the entire span and a concentrated load of 30kN at midspan. Using Castigliano's theorem, determine the deflection of the beam at midspan. Flexural rigidity is EI= 350000kNm^2.	10	DEC 2022
4.	Apply moment area theorem, obtain the slope and deflection at the free end of a cantilever beam of length L carrying a point load P at the free end. Flexural rigidity is EI.	4	
5.	Analyse the truss in Fig. by method of joints. 	10	

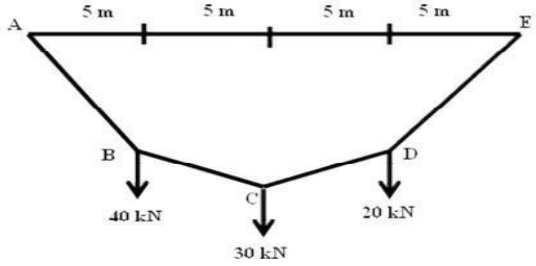
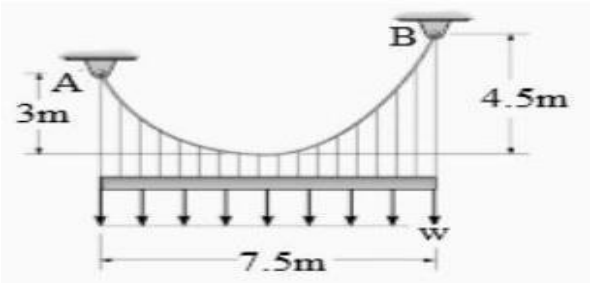
6.	Write two differences between method of joints and method of sections.	3	DEC 2023
	State the 'Moment Area Theorem' with an example.		
	Explain why it is assumed that 'loads are applied only at the joints' in the analysis of truss by method of joints.		DEC 2022
	State and explain Castigliano's first theorem for deflection.		DEC 2021
7.	Analyse the pin jointed truss as shown in figure 1 by the method of joints.  Figure 1	14	DEC 2021
8.	Find the slope and deflection at B of the cantilever using moment area method. E= $2x10^5$ N/mm^2, I = 8500 cm^4.  Figure 2	8	
9.	A Pratt roof truss is loaded as shown. Using the method of sections, determine the forces in members FH and GI.  	14	APR 2018
10.	Write the steps in the analysis of determinate truss by the 'method of sections', indicating the conditions for selection of section.	5	AUG 2021
11.	Explain the effects of temperature change and lack of fit in a statically determinate truss.	3	
	Module – 2		
1.	Figure shows a loaded beam of span l0 m. Compute the vertical deflection at D using the unit load method. E = 200 GPa and I = $60*10^6$ mm^4.	14	DEC 2023

			
2.	Figure shows a propped cantilever beam of span 5 m propped at B. Analyse using consistent deformation method and draw the BMD. 		
3.	Determine the support reactions in the beam shown in Fig. using method of consistent deformation. 	11	DEC 2022
4.	Differentiate between the response of statically determinate structures and statically indeterminate structures to i) temperature change ii) support settlement.	4	DEC 2022
5.	Show how unit load method is applied for finding deflection of a truss and state the formula.	3	DEC 2023
	Show how consistent deformation method is used to find the prop reaction of a cantilever beam.		DEC 2021
	Explain about the lack of fit of an indeterminate frame.		
	Write the steps for analysing beam by the consistent deformation method.		
6.	Analyse the beam shown using consistent deformation method and draw the SFD and BMD.  Figure 3	14	DEC 2021
7.	State Maxwell's law of reciprocal deflections.	4	DEC 2021
	Describe the steps involved in analysis of indeterminate beams by consistent deformation method.	5	
	Derive an expression for deflection by unit load method.	5	

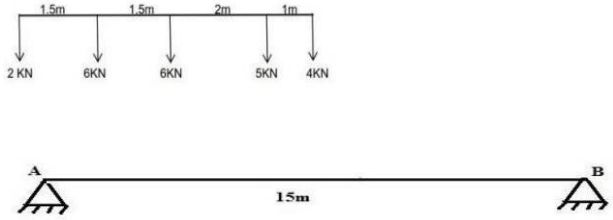
8.	A cantilever beam of span 2 meters carries a vertical concentrated load of 8kN at the free end. Calculate the strain energy due to axial force, bending moment and shear force in the beam. Cross section is 200mm x 400mm, Young's modulus, E = 200GPa. Poisson's ratio, υ= 0.3. Also calculate the deflection at the free end using work done- strain energy relation.	12	AUG 2021
	Explain the effects of temperature change and lack of fit in a statically determinate truss.	3	
9.	Determine the horizontal deflection at B by unit load method. Given E= 200GPa. Cross section of the members is circular with 150mm diameter. 	9	AUG 2021
10.	State Betti's theorem.	4	MAY 2019
	Explain the Principle of least work.	3	
11.	Derive the expression for strain energy due to bending moment.	3	DEC 2019
	Determine the deflection at the free end of the cantilever using strain energy method. Given E= 200GPa, I = 6.67 x 10^7mm^4. 	10	
12.	Differentiate static and kinematic indeterminacies with one example each.	5	MAY 2017
	Demonstrate unit load method as applied to the analysis of a rigid frame.	5	
Module – 3			
1.	Figure shows a loaded frame. Analyse using 'Slope Deflection Method', determine the end moments and draw the BMD.	14	DEC 2023

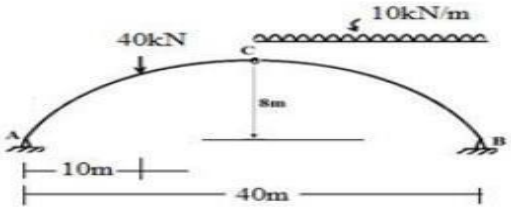
			
2.	Figure shows a loaded beam of length 11m. Analyse using 'Moment Distribution Method', determine the end moments and draw the BMD. 	14	DEC 2023
3.	Analyse the continuous beam shown in Fig. using moment distribution method. Draw bending moment diagram and calculate support reactions. EI is constant. 	14	DEC 2022
4.	Analyse the frame shown in Fig. using slope- deflection method. EI is constant. Draw a bending moment diagram. 	14	DEC 2022
5.	Write down the slope-deflection equation for the near end of a beam with fixed end and describe the terms.	3	DEC 2023

	What is the carry-over factor used in 'Moment Distribution Method'? Show how it is obtained for a member with fixed far end.		
6.	What are the reasons for sway in frames?	3	DEC 2021
	What are the assumptions used for the analysis of frame?		
	Write a note on (i) distribution factor and (ii) carry over moment.		
Module – 4			
1	A cable is hanging between two supports A and B at a horizontal distance of 80 m. Three concentrated loads of 30 kN, 40 kN and 50 kN are hanging from points C, D and E at horizontal distances of 30 m, 50 m & 60 m respectively from support A. Point C is 5 m below supports A and B. Determine the support reactions, cable tensions with its angles and the length of the cable.	14	DEC 2023
2	A cable of horizontal span 90 m is hanging between two hinged supports A and B and is subjected to a uniformly distributed load of 24 kN/m. The left support A is 5 m above support B and the boffom-most point of the cable is 5.rn below right support B. The left side of the cable is clamped to a saddle with smooth rollers resting on top of a pier balanced by a cable inclined at 300 to the horizontal. Determine the maximum cable tension. tension in the anchor cable and the forces on the supporting pier.	14	DEC 2023
3	Prove that a freely suspended cable subjected to a UDL takes the shape of a parabola.	4	DEC 2022
	Discuss the difference between guide pulley support and saddle support used for passing the cable of a suspension bridge on a supporting tower.		DEC 2022
	Draw a neat sketch showing the major components of a suspension bridge.	3	DEC 2023
	Describe the pulley support for a suspended cable with the help of a sketch and show the forces acting on it		
	Write the equation for support reactions and H, when cable is subjected to a UDL of w kN/m over the span.		DEC 2021
4	A cable of span 200 meter and dip 12m carries a load of 10kN per meter run of horizontal span. Find 1. The maximum tension in the cable and the inclination of the cable at the support. 2. The forces transmitted to the supporting pier if the cable is clamped to a saddle with smooth rollers resting on the top of the pier. Anchor cable is inclined at 30° to the horizontal.	14	DEC 2021

	3. Calculate the length of the cable.		
5	A cable of span 50meter is supporting four concentrated loads 30kN, 40kN, 10kN and 15kN respectively at points C, D, E, and F which are 10m, 20m 30m and 40m from left support. Both supports are in same level. Dip of point D is 7m. Calculate the support reactions and the tensions in the various parts of the cable. Also find the length of the cable.	14	DEC 2021
6	With neat sketch, discuss the profile/shape of cable subjected to uniformly distributed load 'w' per unit horizontal length.	5	DEC 2018
	A bridge cable is suspended from towers A and B, 80 m apart and carries a load 30 kN/m on the entire span. If the maximum sag is 8m at point C, calculate the maximum tension in the cable. If the cable is supported by saddles which are stayed by wires inclined at 30 degrees to the horizontal, determine the forces acting on the towers. If the same inclination of back stay passes over pulley, determine the forces on the towers.	15	
7	A light cable is supported at two points 20 m apart which are at the same level. The cable supports three concentrated loads as shown in figure. The deflection at first point is found to be 0.8m. Determine the tension in the different segments and the total length of the cable. 	14	DEC 2018
8	The cable supports the uniform load of w=8kN/m. Determine the tension in the cable at each support A and B. 	10	APR 2018
9	A bridge cable is suspended from towers 80 m apart and carries a load of 30 kN/m on the entire span. If the maximum sag is 8 m, calculate the maximum tension in the cable. If the cable is supported by saddles which are stayed by wires inclined at 300 to the horizontal, determine the forces acting on the towers. If the	14	MAY 2017

	same inclination of back stay passes over pulley, determine the forces on the towers. Height of the tower is 10m.		
Module – 5			
1	A three-hinged arch of horizontal span AB = 36 m has a rise of 9 m. It is subjected to a uniformly distributed load of 12 kN/m over the right half and a concentrated load of 75 kN at D, 12 m horizontally to the left of the middle hinge C. Analyse and determine the reactions and horizontal thrust. Also determine the bending moment, normal thrust and radial shear at E, 9 m horizontally to the left of right support B.	14	DEC 2023
2	A train of moving loads 60 kN, 50 kN, 40kN and 50 kN (distance between each load being 2.5 m) is moving from left to right (60 kN leading) on a simply supported beam of span AB = 30 m. Compute the maximum SF and BM at a point C, l0 m from left support A. If a uniformly distributed load 25 kN/m and 7.5 m long is moving on the bcam, determine the absolute ma:rimum BM anywhere in the beam.	14	DEC 2023
3	A uniformly distributed load 40kN/m and 5m long traverses a simply supported beam AB of span 15m from left to right. Draw the influence line diagram for shear force and bending moment at a section 6m from A. Calculate the maximum shear force and bending moment at this section using these diagrams.	11	DEC 2022
	Draw the bending moment diagram of an arch of span L and central rise h carrying a concentrated load W at distance a (a<L/2) from the left support.	3	
4	Draw ILD for the support reactions of a simply supported beam	4	DEC 2022
	State and explain Eddy's theorem	3	DEC 2021
	Write the significance of influence line diagram.		
5	Explain about the types of arches.	4	DEC 2021
	A three hinged parabolic arch hinged at the supports and at the crown has a span of 30m and a central rise of 4m. It carries a concentrated load of 60kN at 18m from left support and a uniformly distributed load of 30 kN/m over the left half portion. Determine the moment, normal thrust and radial shear at a section of 7.5m from the left support.	10	
6	Draw ILD for SF and BM at any intermediate section of overhanging beams.	4	DEC 2021
	A simply supported beam has a span of 20m. UDL of 50 kN/m and 5m long crosses the girder from left to right. Draw ILD for SF and BM at a section 7m from left end. Calculate the maximum	10	

	positive shear force, maximum negative shear force, and maximum bending moment at this section.		
7	A semi-circular arch and a parabolic arch are having the same span and they support a uniformly distributed load of w per unit run over the whole span. Find the horizontal thrust and support reactions for these 3- hinged arches. Radius of the semi-circular arch is R and the rise of parabolic arch is 1/4th of its span.	10	AUG 2021
8	Explain with the help of sketches, the different types of arches	8	MAY 2019
9	State Eddy's theorem, normal thrust and radial shear at a section 2m from left support.	5	MAY 2019
	A parabolic three hinged arch carries a UDL of 30kN/m on the left half of the span. It has a span of 16 m and a central rise of 3 m. Determine the resultant reactions at the supports. Find the bending moment	15	
10	Draw the influence lines for shear force and bending moment at a point C of the beam shown in figure. 	6	MAY 2019
11	A train of concentrated loads moves from left to right on a simply supported girder of span 15 m, and 4kN load leading as shown in figure. Determine the maximum shear force and the maximum bending moment at a section 4m from left support. 	12	MAY 2019
12	A 3-hinged parabolic arch has a span of 18m and a rise of 6m. The arch is hinged at the springing A and B and at the crown C. It carries a UDL of 20kN/m over the left half of the span and a point load of 100kN at 4.5m from the right support B. Find the bending moment, normal thrust and radial shear at a section 3m from left end.	15	DEC 2019
	Draw the influence line diagram for bending moment at any section of a three hinged arch.	5	
	Draw the influence line for reactions in a simply supported beam of span 'L' with overhang 'a' on the right side.	3	DEC 2023

13	A three-hinged parabolic arch is loaded as shown in figure. Calculate the location and magnitude of maximum bending moment in the arch. Draw bending moment diagram.  	15	APR 2018

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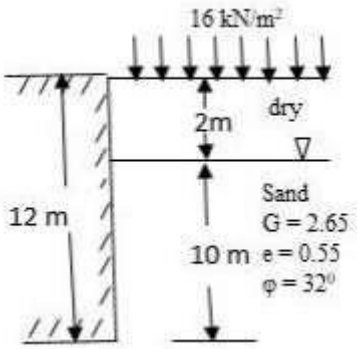
CET305 GEOTECHNICAL ENGINEERING II

MODULE I			
Sl. No.	**Question**	**Marks**	**Year**
1.a.	Draw and explain the plot between variation of earth pressure along with movement of retaining wall	3	KTU 2023
1.b.	What is the effect of surcharge on depth of tension crack in case of a retaining wall with purely cohesive backfill? Explain?	3	KTU 2022
1.c..	Excavation was being carried out for a foundation in a plastic clay with a unit weight of 22.5 kN/m3. Failure occurred when a depth of 8.1m was reached. What is the value of cohesion if the angle of internal friction is 0°	3	KTU 2024
2.a.	A retaining wall of 10 m height has sandy backfill with voids ratio of 0.65, angle of internal friction of 30° and a specific gravity of 2.65. The water table is at a depth of 3m from the ground surface. Determine the magnitude and point of application of total active earth pressure.	10	KTU 2023
2.b.	Determine the Rankine's passive force per unit length of the wall retaining 2 layers of soil, each of 2m height. The top layer of soil has a unit weight of 16 kN/m, angle of internal friction of 30° and cohesion of 0 kN/m2. The bottom layer has a saturated unit weight of 19 kN/m3, angle of internal friction of 24° and cohesion of 10 kN/m2. Assume the water table at a depth of 2 m below the ground surface. Take unit weight of water as 10 kN/m3. Also find the point of application of the calculated lateral thrust.	10	KTU 2024
2.c.	Compute the total lateral earth thrust exerted by a layered backfill of height 10m if the wall has a tendency to move towards backfill. The upper layer of thickness 6m has angle of internal friction 32° and saturated unit weight 18kN/m3. The lower layer has angle of internal friction 28°, cohesion20kPa, and saturated unit weight 19kN/m3. The backfill also supports a uniform surcharge of intensity 8kN/m2 Water table is at a depth of 5m below the surface of the backfill. Also find the point of application.	10	KTU 2018
3.a.	A wall of 8m height retains a non-cohesive backfill of dry unit weight 18kN/m3 and φ =30°. Using Rankine's theory find the total active thrust on the wall and the point of application if it carries a uniform surcharge load of 10kPa.	8	KTU 2019
3.b.	A 6m high retaining wall with smooth vertical back supports a two layered stratum. Calculate the magnitude of active pressure per metre length of wall for the following data I layer: H1= 4m, c=0, ϕ= 35°, γ = 18 kN/m3 II layer: H2= 2m, c=0, ϕ= 30°, γ = 19 kN/m3	7	KTU 2020
4.a.	What is the effect of tension crack in earth pressure of cohesive backfill? A 5m high retaining wall supports a clayey backfill with bulk density 18 kN/m3, cohesion = 30 kN/m3 and ϕ= 30°.Determine the earth pressure developed per metre length of the wall when wall is pushed towards the backfill and also the point of application.	4	KTU 2020
4.b.	An excavation is to be carried out in a soil with angle of internal friction=300; cohesion=10KPa. unit weight =20 KN/m3. Find	7.5	KTU 2019

	the maximum stable depth up to which excavation can be carried out without failure.		
5.a.	A retaining wall [h=5m] supports a granular backfill [angle of internal friction=360; unit weight above WT=16KN/m3; unit weight below WT=19KN/m3. WT table is at a depth of 2m beneath the backfill surface. Determine the total active earth pressure.	7.5	KTU 2019
5.b.	List the assumptions of Rankine's earth pressure theory	7.5	KTU 2019
6.a.	Explain the advantages and limitations of any 3 types of shallow foundations	7.5	KTU 2021
6.b.	Mention any three selection criteria of type of foundation	3	KTU 2022
7	Define (i) active earth pressure, (ii) passive earth pressure and (iii) earth pressure at rest. Mention its equations	3	KTU 2022
8	For an earth retaining structure shown in Figure, construct earth pressure diagram for active state and find the total thrust per unit length of the wall 	10	KTU 2022
9	A smooth retaining wall 6m high retains dry granular backfill weighing 16kN/m3 to its level surface. The active thrust on the fall is 96kN/m of wall. What will be the total active thrust if the water table comes up to backfill surface? Take specific gravity of backfill = 2.65	6	KTU 2022
10	Define depth of tension crack in cohesive soils and write an expression for its evaluation	4	KTU 2022

MODULE 2			
1.a.	Explain Skempton's theory for calculating net ultimate bearing capacity	3	KTU 2024
1.b.	A strip footing of 2 m width is founded at a depth of 4 m below the ground surface. Determine the net ultimate bearing capacity using Skempton's equation. The soil is clay with a cohesion of 10 kN/m2 .	3	KTU 2023
2.a.	A continuous footing of width 2.5 m rest at 1.5 m below the ground surface in clay. The unconfined compressive strength of clay 150 kN/m2. Calculate the ultimate bearing capacity of footing. Assume unit weight of soil as 16 kN/m3. 3 5 List out any 3 causes of differential settlement	3	KTU 2024
2.b.	What is equations and limitations of Terzaghi's bearing capacity theory.	5	KTU 2019
3.a.	Estimate the net ultimate bearing capacity of a circular footing of 2.5m diameter placed at 1.5m depth, in a lateritic soil (cohesion=48KPa; unit weight=18KN/m3). Bearing capacity factors are Nc=10, Nq=3, NY=1.5.	7.5	KTU 2019
3.b.	Explain Terzaghi's theory for calculation of ultimate bearing capacity of soil.	7	KTU 2024
4.a.	Explain any 6 factors affecting bearing capacity of soil	3	KTU 2023
4.b.	What are the soil types for which local shear failure can be expected? Draw the typical pressure versus settlement curve for such a failure.	7	KTU 2018
5.a.	Compute the safe bearing capacity of a continuous footing 1.8 m wide and located at a depth of 1.2 m below the ground level in a soil with unit weight of 20 kN/m3, cohesion of 20 kN/m2. Assume factor of safety as 2.5. What is the permissible load per metre run of the footing? Take Nc = 17.7, Nq = 7.4 and Nγ = 5.	7	KTU 2023
5.b.	A square footing 2 m wide is founded at a depth of 1.4 m in sand. Soil properties are c=0, ϕ= 35°, γsat = 19 kN/m3 and unit weight above water table = 17.5 kN/m3. Bearing capacity factors are Nq= 41.4 and Nγ = 42.4. Determine Ultimate bearing capacity if water table is at i) 3.5 m below ground level ii) 1.4 m below ground level	7	KTU 2020
6.a.	A strip footing 1.5m wide with its base at a depth of 1 m is resting on dry sand stratum. Take unit weight as 17 kN/m3, saturated unit weight as 20 kN/m3, cohesion = 0, Nq = 65.34 and Nγ = 77.2. Determine the ultimate bearing capacity of footing if the ground water is located at a depth of: i) 0.5 m below ground surface ii) 0.5 m below the base of the footing	5	KTU 2023
6.b.	Determine the ultimate bearing capacity of a strip footing 1.2 m wide and having the depth of foundation of 1.0 m. The water table reaches at the ground surface during rainy season. (γsat = 19 kN/m3, c = 15 kN/m2 , Nc =57.8, Nq = 41.4 and Nγ = 42.4).	8	KTU 2018
7.a.	Determine the net allowable load for a circular footing of 2.5 m diameter founded at a depth of 1.2m. Soil properties are c = 80 kN/m2, take factor of safety as 3.	5	KTU 2020
7.b.	Determine the safe load that can be carried by a circular footing [diameter=1.5m] founded at a depth of 0.9m in a soil with cohesion=55kPa and angle of internal friction=100. Water table is at a depth of 2.8m beneath the ground surface. However, the soil above water table is also saturated [γsat=17kN/m3] due to capillarity. Nc=9.6; Nq=2.7; Nγ= 1.2. Assume general shear	15	KTU 2018

	failure to materialise in the field and take factor of safety against shear failure as 3. What will be the % reduction in net safe bearing capacity, if water table rises to the ground surface?		
8.a.	Two footings A and B, both having length of 22m, are placed on the surface of a dry, purely granular soil. Widths of footings A and B are 2.5m and 1.5m respectively. Determine the ratio of their net safe bearing capacities.	7.5	KTU 2021
8.b.	Define (i) Gross pressure intensity (ii) Net ultimate bearing capacity (iii) Safe bearing capacity	3	KTU 2022
9.a.	Elucidate any three limitations in Terzaghi's analysis	3	KTU 2022
9.b.	A square footing located at a depth of 1.3m below the ground has to carry a safe load of 800kN. Using Terzaghi's analysis, find the size of the footing if the desired factor of safety is 3. The soil has the following properties: e = 0.55, S = 50%, G=2.67, c= 8 kN/m2, φ = 300 (Nc = 37.2, Nq = 22.5, N γ =19.7)	8	KTU 2022
9.c.	Explain the effect of water table on bearing capacity of foundation if the water table is a) at the base of the footing, b) at a depth equal to width of the footing with equations and c) at intermediate position with equation.	6	KTU 2022
10.a.	Determine the ultimate net bearing capacity of the circular footing (diameter 2m and depth of footing is 1.5m) resting on a clayey soil (cu = 48 kN/m2, γ = 17.66 kN/m3, Nc = 5.7). The initial water table level is at 3.5m from the base of the footing. Also, compute the change in ultimate net bearing capacity, if the entire region is flooded, due to which the ground water level reaches ground level.	8	KTU 2022
10.b.	Explain the type of shear failure can be expected for footings located at considerable depth, if the subsoil is of low compressibility? Draw the typical pressure versus settlement curve for the same condition	6	KTU 2022

MODULE 3			
1.a.	A rectangular footing 3m x 2m exerts a pressure of 100kN/m2 on a cohesive soil. E = 5 x 104 kN/m2 .and poissons ratio of 0.5. Determine the immediate settlement at the centre assuming footing is a) rigid b) flexible. Take influence factor for flexible footing as 1.36 and that of rigid footing as 1.06.	4	KTU 2023
1.b.	Design the plan dimensions of a combined footing for the following data: size of columns=300mm×300mm; column loads=1075kN & 925kN; centre to centre distance between columns=4m; clear space available beyond the outer face of both columns=0.10m. Safe bearing capacity=178kPa.	13	KTU 2018
1.c.	What type of shear failure can be expected for footings, if the subsoil consists of dense homogeneous coarse grained soil? Draw the typical pressure versus settlement curve of in such a situation.	5	KTU 2018
2.a.	State any 3 causes of differential settlement.	3	KTU 2018
2.b.	What remedial measures can be taken to control the differential settlement of foundations?	5	KTU 2017
2.c.	Explain plate load test in terms of its procedure and uses	8	KTU 2024
3.a.	Design the plan dimensions of a trapezoidal footing to support two adjacent columns at a centre to centre distance of 5m carrying loads of 1500kN and 3000kN. The smaller column is of size 400mmx400mm and is at a clear distance of 250mm from the property line. The bigger column is of size 750mmx750mm. The permissible soil pressure is 300kPa.	8	KTU 2017
3.b.	Design a combined trapezoidal footing for two columns of sizes 0.5 m x 0.5 m and 0.3 m x 0.3 m carrying loads 3000 kN and 2000 kN respectively. Centre to centre distance of columns = 5 m. Footings shall not project beyond the outer surface of columns. Allowable soil pressure is 250 kN/m2	7	KTU 2017
3.c.	Explain the conventional design procedure for mat foundations.	7	KTU 2023
4.a.	How can the allowable bearing capacity of rafts on clay be estimated?	7.5	KTU 2019
4.b.	Outline the maximum and differential settlements as per Indian standards. Mention any three causes of differential settlement. Suggest any three measures for reducing the same.	7	KTU 2024
4.c.	Design a rectangular combined footing for two columns, each of size 250mmX250mm, the magnitude of column loads being 850kN and 1050kN. c/c distance between columns is 3.8m and a clear spacing of 0.125m only is available beyond the outer face of 850kN column. Take SBC of subsoil as 202kPa.	7.5	KTU 2019
5.a.	What are the situations where raft foundations are preferred? What is meant by floating foundation?	7.5	KTU 2019
5.b.	What are the two criteria for design of rectangular combined footings ?	4	KTU 2021
6.a.	Design a rectangular combined footing to support two adjacent columns (size 40 cm x 40 cm). The centre lines of the columns are placed on footing at a distance of 5. 0 m between them. The boundary is 0.5 m away from centre line of column A. The column A and B carry load of 3 MN and 4 MN respectively. The allowable soil pressure is 400 kN/m2	8	KTU 2021

6.b.	Mention any one practical situation wherein trapezoidal combined footings are preferred to rectangular combined footings.	2	KTU 2021
7.a.	Design the plan dimensions of a combined footing for the following data: size of columns=300mm×300mm; column loads=1075kN & 925kN; centre to centre distance between columns=4m; clear space available beyond the outer face of both columns=0.10m. Safe bearing capacity=178kPa	13	KTU 2018
7.b.	Explain floating foundation	3	KTU 2022
8.a.	Define (i) allowable settlement (ii) total settlement (iii) differential settlement	3	KTU 2022
8.b.	Explain Plate load test with neat sketch. List the limitations of plate load test.	8	KTU 2022
9	A footing 3m x 1.5m in plan transmits a pressure of 160 kN/m2 on a cohesive soil having E = 8x104 kN/m2 and μ = 0.48. Determine the immediate settlement at the centre, assuming the footing to be (a) flexible (Iw = 1.52), and (b) rigid (Iw = 1.22)	6	KTU 2022
10.a.	Explain the method for estimating total settlement for shallow footing	8	KTU 2022
10.b.	A plate load test was conducted in a sandy soil with a plate of size 0.3m x 0.3m. The ultimate load per unit area was found to be 2.0 kg/cm2. Find the allowable load for a footing of2m x 2m, using a factor of safety of 3.	6	KTU 2022

<table>
<tr><th colspan="4">MODULE 4</th></tr>
<tr><td>1.a.</td><td>State the I.S. guidelines for estimation of safe load on a single pile, from pile load test results.</td><td>4</td><td>KTU 2018</td></tr>
<tr><td>1.b.</td><td>Clearly differentiate between “initial test” and “routine test” on pile. What is meant by a working pile?</td><td>6</td><td>KTU 2018</td></tr>
<tr><td>1.c.</td><td>Explain plate load test in terms of its procedure and uses</td><td>3</td><td>KTU 2023</td></tr>
<tr><td>2.a.</td><td>Suggest any 3 methods for rectification of tilts of well foundations. Draw neat sketches to illustrate the same.</td><td>7</td><td>KTU 2018</td></tr>
<tr><td>2.b.</td><td>Explain with neat sketches, the various elements of a well foundation.</td><td>7</td><td>KTU 2017</td></tr>
<tr><td>3.a.</td><td>What is negative skin friction? What are the causes?</td><td>5</td><td>KTU 2017</td></tr>
<tr><td>3.b.</td><td>Draw the load settlement curve for loading and unloading obtained from IS plate load test</td><td>3</td><td>KTU 2024</td></tr>
<tr><td>3.c.</td><td>A group of 9 piles with 3 piles in a row was driven into a soft clay extending from ground level to a great depth. The diameter and length of piles were 30 cm and 10 m respectively. The UCC strength of clay is 70kPa. If the piles were spaced 90 cm centre to centre. Compute the allowable load on the pile group on the basis of shear failure criterion for FOS of 2.5. Take adhesion factor as 1.</td><td>8</td><td>KTU 2024</td></tr>
<tr><td>4.a.</td><td>Using modified Hiley’s formula, determine the safe load that can be carried by a pile. The gross weight of the pile is 1400kg, weight of hammer 2000kg, height of fall 91cm, hammer efficiency 70%, average penetration under the last 5 blows is 10 mm, coefficient of restitution is 0.55 and the factor of safety is 2.5. assume C=2.5 and e = 0.5</td><td>8</td><td>KTU 2017</td></tr>
<tr><td>4.b.</td><td>Explain the static method for determining the load carrying capacity of driven piles in sand. Determine the ultimate bearing capacity of soil along the length of a concrete pile of diameter 45 cm driven into sand of loose to medium density to a depth of 15 m. Take Nq = 16.5. Assume the water table at a great depth. The following are the properties: Average unit weight of soil is 17.5 kN/m2, angle of internal friction of 30°, lateral earth pressure coefficient of 1.5. Also determine the allowable load with a factor of safety of 2.5.</td><td>10</td><td>KTU 2023</td></tr>
<tr><td>5.a.</td><td>What are the IS guidelines for choosing depth and spacing of Bore holes?</td><td>6</td><td>KTU 2020</td></tr>
<tr><td>5.b.</td><td>A pile load test is done on a 30 cm diameter pile. Determine the safe load considering settlement and shear failure criteria. Take factor of safety as 2.5 for shear failure criteria.
<table><tr><td>Load (kN)</td><td>0</td><td>200</td><td>400</td><td>600</td><td>800</td><td>1000</td></tr><tr><td>Settlement (mm)</td><td>0</td><td>1.5</td><td>4.0</td><td>7.75</td><td>14.0</td><td>24.0</td></tr></table></td><td>10</td><td>KTU 2021</td></tr>
<tr><td>5.c.</td><td>Determine safe load for a concrete pile 30 cm diameter driven into dense sand for a depth of 7 m. The soil properties are = 35°, γ =19 kN/m3, K =2, Nq= 60, Ny = 42.4. Take critical depth for overburden pressure as 15 and factor of safety as 2.5.</td><td>10</td><td>KTU 2020</td></tr>
<tr><td>6.a.</td><td>A circular concrete pile of diameter 500mm is installed in a clay stratum having undrained shear strength of 99kPa. Determine the length of pile needed, if pile has to carry a load of 370kN with factor of safety of 3 against shear failure. Take adhesion factor as 0.5.</td><td>10</td><td>KTU 2019</td></tr>
</table>

<table>
<tr><td>6.b.</td><td>A 0.3m×0.3m precast concrete pile, 10m long is driven into a ground. The total penetration for the last five blows is observed as 12mm. Determine the ultimate load on pile (Qu) for the following data: weight of hammer=30kN; Height of fall of hammer=90cm; efficiency of hammer= 0.85; sum of the temporary elastic compressions [in mm] of the dolly, packing, pile and ground= (0.005) Qu, where Qu is in kN. Efficiency of blow may be assumed as 0.5.</td><td>10</td><td>KTU 2019</td></tr>
<tr><td>6.c.</td><td>Results of load test on a pile [diameter=450mm] are given below: Estimate the safe load as per I.S.
<table>
<tr><td>Load (kN)</td><td>225</td><td>300</td><td>375</td><td>450</td><td>600</td><td>750</td><td>900</td></tr>
<tr><td>Settlement (mm)</td><td>2.9</td><td>4.2</td><td>5.5</td><td>7.2</td><td>11.8</td><td>21.5</td><td>45</td></tr>
</table></td><td>10</td><td>KTU 2019</td></tr>
<tr><td>7.a.</td><td>An RCC pile (of 500mmX500mm size and length 6m) is installed in a granular soil having unit weight =17kN/m3, coefficient of earth pressure = 1.5; angle of wall friction=22. Determine the ultimate skin friction load that can be carried by pile.</td><td>10</td><td>KTU 2019</td></tr>
<tr><td>7.b.</td><td>A 3X3 friction pile group, each pile having a length of 10m and diameter of 0.4m is installed in a homogeneous clay layer having undrained shear strength of 50kPa. Take adhesion factor as 0.75. Estimate the ultimate load on the pile group. c/c spacing of piles = 0.9m</td><td>10</td><td>KTU 2019</td></tr>
<tr><td>7.c.</td><td>Explain [with a sketch] negative skin friction on pile. A circular concrete pile of diameter 300mm and length 8m is installed in a subsoil consisting of top 2.5m of recently filled up soil (cohesion of 25kPa). Determine the negative skin friction on the pile. Take adhesion factor as 0.5.</td><td>10</td><td>KTU 2019</td></tr>
<tr><td>8.a.</td><td>A 50 cm concrete pile is driven in a normally consolidated clay deposit 15 m thick. Cu = 70 kN/m2, α = 0.9 and Factor of safety is 2.0. Estimate the safe load.</td><td>5</td><td>KTU 2018</td></tr>
<tr><td>8.b.</td><td>A bored pile in a clayey soil failed at an ultimate load of 400kN. If the pile is 50 cm diameter and 10 m long, determine the capacity of a group of nine piles spaced 1 m centre to centre both ways. Take Cu = 70 kN/m2 and α = 0.5.</td><td>8</td><td>KTU 2018</td></tr>
<tr><td>8.c.</td><td>Write Modified Hiley formula and describe each terms in the formula</td><td>5</td><td>KTU 2018</td></tr>
<tr><td>9.a.</td><td>Explain the procedure of determination of safe load from static pile load test</td><td>12</td><td>KTU 2018</td></tr>
<tr><td>9.b.</td><td>Write down the procedure for determination of safe load on a single pile in sands.</td><td>10</td><td>KTU 2018</td></tr>
<tr><td>9.c.</td><td>What is negative skin friction?</td><td>3</td><td>KTU 2022</td></tr>
<tr><td>10.a.</td><td>Write an expression to determine dynamic pile capacity</td><td>3</td><td>KTU 2022</td></tr>
<tr><td>10.b.</td><td>A group of 9 piles of 600mm diameter is arranged in a square pattern with centre to centre spacing of 1.2m. The piles are 10m long and are embedded in soft clay with cohesion of 30 kN/m2. Adhesion factor is 0.6 and bearing resistance is neglected. Evaluate the ultimate load capacity of the pile group.</td><td>6</td><td>KTU 2022</td></tr>
<tr><td>10.c.</td><td>Briefly explain the classification of piles with neat sketches based on (i) its function and (ii) materials of construction</td><td>8</td><td>KTU 2022</td></tr>
</table>

MODULE 5			
1.a.	State the I.S. guidelines for choosing the minimum number of borings in a soil exploration programme. Find the minimum number of boreholes for a rectangular plot of size 40m ×300m.	7	KTU 2018
1.b.	Explain Standard Penetration test and its correlations with shear strength parameters. What are the corrections to be applied for SPT value?	7	KTU 2023
2.a.	Explain boring log and soil profile using suitable diagrams	7	KTU 2023
2.b.	Explain any 3 types of samplers using neat sketches. Name the type of sampler used for standard penetration test.	10	KTU 2024
3.a.	State the I.S. guideline for minimum number of boreholes to be taken for a rectangular area. Determine the minimum number of bore holes needed for a rectangular plot of size (i) 80mX100m and (ii) 300mX80 m?	10	KTU 2019
3.b.	Mention any five objectives of site investigation. Also point out any 5 information that can be collected during reconnaissance.	10	KTU 2019
4.a.	State any two merits of auger boring method of soil exploration compared to wash boring. Mention the soil types for which the auger boring method is applicable. Mention the different types of augers and draw a neat sketch of any one.	10	KTU 2019
4.b.	What is meant by dilatancy correction? What are the soil types/soil states for which the above correction is applied? Give the related equation for dilatancy correction.	10	KTU 2019
5.a.	Determine the corrected N value if a SPT test is conducted on a sand deposit of 12 m depth having a unit weight of 17 kN/m2. Assume the water table is at a height of 5 m from the base of the sand deposit. Take submerged unit weight of sand as 19 kN/m2. The N value obtained from the test is 34.	7	KTU 2024
5.b.	Explain in detail the procedure for standard penetration test. What are the corrections to be applied to the N-Value?	15	KTU 2018
6.a.	Explain in detail about sampling, disturbed, undisturbed and chunk samples	8	KTU 2021
6.b.	Briefly elaborate on the geophysical methods: Seismic Refraction method and Electrical Resistivity method.	7	KTU 2021
7.a.	Mention any three objectives of soil exploration	3	KTU 2022
7.b.	List out any 3 limitations of electrical resistivity method	3	KTU 2023
8.a.	Explain Auger boring and wash boring methods used in soil exploration	6	KTU 2022
8.b.	Explain in detail the procedure for standard penetration test. How it is correlated with shear strength parameters? Mention its applications	8	KTU 2022
9	How the depth of exploration are decided as per the guide rules?	6	KTU 2022
10	Explain (i) Seismic refraction method and (ii) Electrical Resistivity method. Mention its applications	8	KTU 2022

CET309 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

MODULE I			
Sl. No.	**Question**	**Marks**	**Year**
1.	Discuss the importance of gradation of aggregates	3	KTU 2024
2.	List out different constituents of Portland cement with their percentage content		KTU 2024
3.	Explain the tests for determining soundness and specific gravity of given cement sample.	8	KTU 2024
4.	What is bulking of fine aggregate? Explain the phenomenon and write down the necessity of determining the percentage bulking.	7	KTU 2024
5.	How is plywood manufactured? What are its properties?		KTU 2023
6.	State any three applications of accelerators in concrete.	3	KTU 2022
7.	Explain with a flow chart, the manufacturing of cement by dry process.	9	KTU 2022
8.	How is the compressive strength of cement tested?	5	KTU 2021
9.	Explain the properties and uses of superplasticizers and retarders. How are these 9 advantageous in concrete?	9	KTU 2021
10	Explain the importance of using graded aggregates in concrete making.	5	KTU 2020
MODULE 2			
1.	What is segregation and bleeding?	3	KTU 2024
2.	Discuss the necessity of curing of concrete. Explain any 2 methods of curing.	7	KTU 2024
3.	What is workability? Explain any 4 factors affecting workability.	7	KTU 2024
4.	What is plastering? Discuss the objectives of plastering? List out any 2 qualities of a good plaster.	7	KTU 2024
5.	Explain various types of arches with neat sketch.	7	KTU 2024
6.	Distinguish between segregation and bleeding in concrete.		KTU 2023
7.	List the various objectives of plastering.	3	KTU 2023
8.	Explain in detail, the various stages in the manufacturing of concrete.	14	KTU 2022
9.	Explain the indirect tests to determine the tensile strength of concrete.	9	KTU 2021
10.	Discuss the classification of arches based on shape	5	KTU 2020
MODULE 3			
1.	Explain pointing and its benefits.	3	KTU 2024
2.	What is scaffolding? List out different types.		KTU 2024
3.	Explain 3D printing construction	4	KTU 2024
4.	What are the causes of failures of RCC structures?	10	KTU 2024
5.	What is form work? List out the requirements of a good form work. Also explain shuttering of a column with neat sketch.	8	KTU 2024
6.	Distinguish between voided slab technology and filler slab technology with neat figures	6	KTU 2023
7.	Enumerate the advantages of slip form construction.		KTU 2023
8.	Write a note on the process of 3D printing in construction.	3	KTU 2022
9.	Explain with a neat figure, the working principle of filler slab technology. What are its advantages?	9	KTU 2021
10.	Write a note on soil cement block masonry	5	KTU 2021
11.	Explain the concept of prestressing concrete. Differentiate between pre-tensioning and post-tensioning.	9	KTU 2021
12.	What are the various types of formwork available?	5	KTU 2018

<table>
<tr><td colspan="4">MODULE 4</td></tr>
<tr><td>1.</td><td>List out the types of tenders and explain.</td><td>7</td><td>KTU 2024</td></tr>
<tr><td>2.</td><td>What is a contract? Explain any 5 types.</td><td>14</td><td>KTU 2024</td></tr>
<tr><td>3.</td><td>What is the difference between an open tender and a selective tender?</td><td>2</td><td>KTU 2024</td></tr>
<tr><td>4.</td><td>List out the 3 phases included in the life cycle of a construction project. List out any 4 activities to be completed in the 1st phase.</td><td>7</td><td>KTU 2024</td></tr>
<tr><td>5.</td><td>Explain prefabricated construction technology.</td><td>3</td><td>KTU 2018</td></tr>
<tr><td>6.</td><td>Write a note on the BOT contract..</td><td></td><td>KTU 2022</td></tr>
<tr><td>7.</td><td>What are the various contents of a Detailed Project Report (DPR)?</td><td>3</td><td>KTU 2023</td></tr>
<tr><td>8.</td><td>Describe the various processes involved in tendering for a construction project.</td><td>14</td><td>KTU 2022</td></tr>
<tr><td>9.</td><td>Explain any three types of contracts in detail. Discuss the advantages and disadvantages of each.</td><td>14</td><td>KTU 2022</td></tr>
<tr><td colspan="4">MODULE 5</td></tr>
<tr><td>1.</td><td>Discuss the shortcoming of bar chart and the remedial measures of the same with neat sketches.</td><td>14</td><td>KTU 2024</td></tr>
<tr><td>2.</td><td>The following table lists the various activities of a network along with their time estimates (days). Draw the network diagram and determine the critical activities of the network by calculating the floats.
<table>
<tr><th>Activity</th><th>Predecessor</th><th>Duration (days)</th></tr>
<tr><td>A</td><td>-</td><td>6</td></tr>
<tr><td>B</td><td>A</td><td>5</td></tr>
<tr><td>C</td><td>A</td><td>2</td></tr>
<tr><td>D</td><td>B</td><td>5</td></tr>
<tr><td>E</td><td>C</td><td>1</td></tr>
<tr><td>F</td><td>C</td><td>2</td></tr>
<tr><td>G</td><td>D,E</td><td>4</td></tr>
<tr><td>H</td><td>F,G</td><td>5</td></tr>
</table></td><td>14</td><td>KTU 2024</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td>Distinguish between CPM and PERT.</td><td>7</td><td>KTU 2018</td></tr>
<tr><td>4.</td><td>What is a material schedule? Illustrate with an example.</td><td></td><td>KTU 2021</td></tr>
<tr><td>5.</td><td>A project consists of 8 activities with their duration (in weeks) as follows
<table>
<tr><td>Activity</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td></tr>
<tr><td>Duration</td><td>2</td><td>4</td><td>2</td><td>4</td><td>6</td><td>4</td><td>5</td><td>4</td></tr>
</table>
The precedence relationships of activities are as follows: A and B can be performed in parallel. C and D cannot start until A is complete. E cannot start until half the work of activity C is complete. F can start only after activity D is complete. G succeeds C. H is the last activity, which should succeed E. Draw the bar chart and find the total time of completion of the project. If there is an increase of 2 weeks in time of completion of activity A, what will be the corresponding increase in the total time of the completion of the project?</td><td></td><td>KTU 2022</td></tr>
<tr><td>6.</td><td>List the advantages and disadvantages of bar charts.</td><td></td><td>KTU 2021</td></tr>
</table>

MCN 301 DISASTER MANAGEMENT			
SL No.	**Question**	**Marks**	**Year**
MODULE 1			
1	Define the term "biosphere" and describe the three main components that constitute it.	3	KTU DEC 2023
2	What are disasters? What are their causes.	3	KTU DEC 2023
3	a) Briefly explain Indian Monsoonand factors affecting Indian Monsoon? b) Explain greenhouse effect and global warming?	14	KTU DEC 2023
4	Explain the following terms in the context of disaster management (a) Disaster Risk Management (b) Crisis Counselling (c) Exposure (d) Early Warning Systems (e) Damage Assessment (f) Resilience (g) Needs Assessment	14	KTU DEC 2023
5	Differentiate between acceptable risk and residual risk.	3	KTU DEC 2022
6	State the composition of lithosphere?	3	KTU DEC 2022
7	a) Illustrate with diagram the layers of earth's atmosphere. b) State and explain th.e classification of rocks	14	KTU DEC 2022
8	a) State and explain the features of hydrosphere and biosphere in detail. b) Explain the terms resilience, recovery-and early warning systems with respect to disaster risk manasement.	14	KTU DEC 2022
9	Explain the relevance and adverse effects of greenhouse gases.	3	KTU DEC 2021
10	Discuss the two types of monsoon in Indian subcontinent.	3	KTU DEC 2021
11	a) Categorize the various layers of atmosphere based on their distance from earth and explain the features of each layer with a neat diagram. b) Define the following terms: a) Disaster b) Hazard c)Risk	14	KTU DEC 2021
12	a) State and explain crisis counselling. Identify the necessity of crisis counselling. b) Identify the reasons for the depletion of Ozone layer . Suggest two initiatives which can be implemented at home to prevent this.	14	KTU DEC 2021

MODULE 2			
1	Define the term "hazard" and provide examples of natural and human-made hazards	3	KTU DEC 2023
2	Define vulnerability in the context of disasters.	3	KTU DEC 2023
3	a) Explain the types of vulnerabilities and approaches to assess them. b) Explain the application of hazard maps.	14	KTU DEC 2023
4	Describe in detail the approaches and procedures involved in disaster risk assessment.	14	KTU DEC 2023
5	Explain physical vulnerability and ecological vulnerability.	3	KTU DEC 2022
6	Define disaster deficit index.	3	KTU DEC 2022
7	a) Explain the applications of hazard maps. b) Explain the methods of representing vulnerability	14	KTU DEC 2022
8	a) Explain the method of expressing population risk. b)List the components of risk assessment. Explain the contemporary approaches to risk assessment.	14	KTU DEC 2022
9	State the major data requirements of hazard mapping and the 3 sources for obtaining these data.	3	KTU DEC 2021
10	State the principle of qualitative risk assessment and the method of expressing risk qualitatively.	3	KTU DEC 2021
11	a) Define hazard mapping. Explain the two approaches of hazard mapping. b) In Kerala for the past 5 years. the average number of road accidents is 44076 per year and 1 death occurs in every 10 accidents. Considering the population as 3.33 crores, assess the risk of being killed in driving an automobile in terms of societal and individual risk.	14	KTU DEC 2021
12	a) Explain the four different types of vulnerability. List any four socioeconomic indicators of human capital as livelihood asset. b) Outline the two major physical vulnerability assessment approaches.	14	KTU DEC 2021
MODULE 3			
1	Define the term 'disaster preparedness	3	KTU DEC 2023
2	Define 'relief in the context of disaster managent	3	KTU DEC 2023
3	a) Explain the factors that decide the nature of disaster response. b) Explain disaster relief and international relief organizations.	14	KTU DEC 2023
4	a) Explain the core elements of disaster risk management. b) Explain the different disaster response actions.	14	KTU DEC 2023
5	Explain psychosocial support related with disaster response.	3	KTU DEC 2022
6	List any six public health services required in responding to disasters.	3	KTU DEC 2022

7	a) State and explain the types of disaster mitigation measures. b) Identify the factors that determine the nature of disaster response and explain.	14	KTU DEC 2022
8	a) State and explain the types of disaster preparedness. b) Identiff the standard operating procedures to be followed during a disaster stage and explain.	14	KTU DEC 2022
9	State the different types of disaster response	3	KTU DEC 2021
10	List six international relief organizations	3	KTU DEC 2021
11	a) Explain the core elements of disaster risk management. b) State the requirements for effective disaster response.	14	KTU DEC 2021
12	a) Define the term 'disaster risk reduction'. Explain the measures for disaster risk reduction. b) Define 'relief' in the context of disaster management. Identify the principles guiding relief.	14	KTU DEC 2021
MODULE 4			
1	What distinguishes crisis counselling from regular counselling?	3	KTU DEC 2023
2	Explain the importance of communication in disaster management.	3	KTU DEC 2023
3	a) What are the advantages and drawbacks of involving stakeholders in disaster management? b) Explain capacity building in the context of disaster managem	14	KTU DEC 2023
4	a) What is the process for identifying stakeholders in disaster management? b) How can one ensure effective disaster communication by outlining the necessary steps, and what obstacles or barriers to communication should be considered in this context?	14	KTU DEC 2023
5	Explain pyramid scheme related with participatory stakeholder engagement.	3	KTU DEC 2022
6	Define the terms counselling and crisis counselling.	3	KTU DEC 2022
7	a) State and explain the basic principles of participatory rural appraisal tools. b) Explain the characteristics ofeffective crisis counsellors. State the advantages of crisis counselling.	14	KTU DEC 2022
8	a) State and explain the steps for effective communication. b) Identify the barriers to effective communication.	14	KTU DEC 2022
9	Distinguish between risk communication and crisis communication.	3	KTU DEC 2021
10	List the structural and nonstructural measures in capacity building	3	KTU DEC 2021
11	a) Describe the effective ways of promoting stakeholder participation in disaster risk reduction. State its benefits. b) Explain the basic steps in participatory stakeholder engagement.	14	KTU DEC 2021

12	a) Explain capacity building , relevance of capacity assessment and the different methods of assessing capacity in disaster risk management. b) State the barriers to effective communication in disaster management.	14	KTU DEC 2021
	MODULE 5		
1	What role do local governments play in implementing disaster management legislation in India?	3	KTU DEC 2023
2	What are Tsunamis? How are thev caused?	3	KTU DEC 2023
3	a) Discuss the priorities for action identified in the Sendai Framework. How can these priorities be tailored to address the specific needs and challenges faced by India? b) What role do local governments play in implementing disaster management legislation in India.	14	KTU DEC 2023
4	a) Discuss the key features and objectives of the National Disaster Management Policy in India. How does it guide the country in managing and reducing disaster risks? b) What are the most common types of disasters faced by India.	14	KTU DEC 2023
5	Define man-made disasters and list examples from our country.	3	KTU DEC 2022
6	Explain the role of National lnstitute of Disaster Management in our country.	3	KTU DEC 2022
7	a) List the global targets of Sendai framework and explain. b) Explain the role, composition and responsibilities of National Disaster Management Authority	14	KTU DEC 2022
8	a) List the guiding principles of Sendai framework and explain. b) State the composition and role of National Executive Committee related with the National Policy on Disaster Management.	14	KTU DEC 2022
9	State the legislations in India on disaster management	3	KTU DEC 2021
10	Explain the interrelation of National Disaster Management Policy with other national policies.	3	KTU DEC 2021
11	a) Explain the common disaster types in India. b) State the objectives and main elements of national disaster management policy.	14	KTU DEC 2021
12	a) State the targets, priorities and guiding principles of Sendai Framework for disaster risk reduction. b) Explain the institutional arrangement for disaster management in India	14	KTU DEC 2021

CET 307: HYDROLOGY AND WATER RESOURCES ENGINEERING

MODULE1

No.	Questions	Marks	
1	What is a Mass curve?	3	KTU Dec 2021
2	A precipitation station X was inoperative. Precipitation recorded in three stations A,B,C surrounding station X were 6.2 ,4.7and 3.5 cm respectively. Normal annual precipitation amounts to 64.3, 70.7 , 54.5 and 35. 3 cm for stations X,A, B and C. Estimate storm precipitation of X	3	KTU Dec 2021
3	Explain the Thiessen Polygon method of computation of mean precipitation	6	KTU Dec 2021
4	Plot a hyetograph using the following data Time (am): 9.00, 9.05, 9.10, 9.15, 9.20, 9.25, 9.30 Accumulated Rainfall (mm): 0, 2, 6, 12, 15, 17, 20	8	KTU Dec 2021
5	Explain the field measurement of infiltration rate using Double ring infiltrometer	6	KTU Dec 2021
6	What are the different ways to control evaporation? Explain the measurement of evaporation using IMD pan .	8	KTU Dec 2021
7	Explain the working of a Siphon type rain gauge with a neat sketch	5	
8	The average rainfall of 5 rain gauge stations in the base stations are 89, 54, 45, 41 and 55 cm. If the error in the estimation rainfall should not exceed 10 %, how many additional gauges may be required to be installed in the catchment?	9	
9	Compare different methods for determination of mean precipitation from a catchment	6	
10	Explain the use of double ring infiltrometer for the measurement of infiltration. How will you develop Horton's model?	8	
11	Explain the different forms of precipitation	3	
12	What are the methods of control of evaporation from water bodies?	3	

MODULE 2

1	Explain the Two line method of separation of base flow	3	KTU Dec 2021
2	A six hour storm rainfall with following rainfall depths occurs over a basin 2.2, 3.5,5.4,10.2,4.8,3.1 and 6.2 cm. Surface runoff is 10.7 cm. Determine the average infiltration index	3	KTU Dec 2021

<table>
<tr><td>3</td><td>What are the factors affecting Runoff ?</td><td>6</td><td>KTU Dec 2021</td></tr>
<tr><td>4</td><td>Determine the ordinates of unit hydrograph from the following observed flows from a drainage area of 300 sq km of 3 hours duration. Assume A constant flow of 25 cumecs.
<table><tr><th>Time</th><th>Ordinates of storm hydrograph (cumecs)</th></tr><tr><td>0 am</td><td>25</td></tr><tr><td>3 am</td><td>110.3</td></tr><tr><td>6 am</td><td>150.6</td></tr><tr><td>9 am</td><td>139.8</td></tr><tr><td>12 noon</td><td>126</td></tr><tr><td>3 pm</td><td>100.3</td></tr><tr><td>6 pm</td><td>75.9</td></tr><tr><td>9 pm</td><td>48.5</td></tr><tr><td>0 am</td><td>25</td></tr></table></td><td>8</td><td>KTU Dec 2021</td></tr>
<tr><td>5</td><td>What are the assumptions of Unit hydrograph theory?</td><td>6</td><td>KTU Dec 2021</td></tr>
<tr><td>6</td><td>Explain the parts of a single peaked hydrograph .</td><td>8</td><td>KTU Dec 2021</td></tr>
<tr><td>7</td><td>Define unit hydrograph. Explain its uses</td><td>3</td><td></td></tr>
<tr><td>8</td><td>State the limitations of rational formula for runoff estimation</td><td>3</td><td></td></tr>
<tr><td>9</td><td>The rates of rainfall for the successive 30 min period of a 3-hour storm are:1.6, 3.6, 5.0, 2.8, 2.2, 1.0 cm/hr. The corresponding surface runoff is estimated to be 3.6 cm. Estimate the φ -index</td><td>7</td><td></td></tr>
<tr><td>10</td><td>Explain the characteristics of a single peak hydrograph from an isolated storm. How will you separate the base flow?</td><td>7</td><td></td></tr>
<tr><td>11</td><td>Find out the ordinates of a storm hydrograph resulting from a 9 hr storm with rainfall of 2, 5.75 and 2.75 cm during subsequent 3 hr intervals. The ordinates of 3hr unit hydrograph at 3 hr intervals are 0, 100, 355, 510, 380, 300, 260, 225,165, 120,85, 55,30, 22, 10, 0 (cumecs). Assume an initial loss of 0.5 cm and φ -index of 2.5 mm/hr and a base flow of 10 cumecs.</td><td>14</td><td></td></tr>
</table>

MODULE 3

<table>
<tr><td>1</td><td>Define i) Field capacity ii) Permanent wilting point</td><td>3</td><td>KTU Dec 2021</td></tr>
<tr><td>2</td><td>A field has an area of 50 ha. When 10 cumecs of water was supplied for 5 hours, 35 cm of water was stored in root zone. Find Field application efficiency</td><td>3</td><td>KTU Dec 2021</td></tr>
<tr><td>3</td><td>Determine the reservoir capacity for the following data if canal losses are 15 % and reservoir losses are 10%

<table><tr><td>Crop</td><td>Base period</td><td>Duty (hectare/cumecs)</td><td>Area under crop (ha)</td></tr><tr><td>Cotton</td><td>250</td><td>1200</td><td>2500</td></tr><tr><td>Wheat</td><td>130</td><td>1700</td><td>4000</td></tr><tr><td>Rice</td><td>115</td><td>850</td><td>3000</td></tr><tr><td>Vegetables</td><td>125</td><td>665</td><td>1000</td></tr><tr><td>Sugar cane</td><td>360</td><td>800</td><td>5000</td></tr></table></td><td>6</td><td>KTU Dec 2021</td></tr>
<tr><td>4</td><td>Explain the factors affecting duty and methods to improve duty</td><td>8</td><td>KTU Dec 2021</td></tr>
<tr><td>5</td><td>Define various Irrigation efficiencies</td><td>6</td><td>KTU Dec 2021</td></tr>
<tr><td>6</td><td>Explain the different types of Irrigation</td><td>8</td><td>KTU Dec 2021</td></tr>
<tr><td>7</td><td>Differentiate lift irrigation and flow irrigation</td><td>4</td><td></td></tr>
<tr><td>8</td><td>Estimate the frequency of irrigation required for certain crop for the following data: Root zone depth = 90 cm Field capacity = 22 %, Wilting point=12 % Dry density of soil=1500 kg/m3. Daily Consumptive use =22 mm. Assume 70 % depletion of available moisture as an indicator for application of water</td><td>10</td><td></td></tr>
<tr><td>9</td><td>Explain the benefits and ill effects of irrigation</td><td>4</td><td></td></tr>
<tr><td>10</td><td>What are the factors affecting duty? How can you improve the duty of water.</td><td>10</td><td></td></tr>
<tr><td>11</td><td>Explain irrigation efficiencies</td><td>3</td><td></td></tr>
<tr><td>12</td><td>Define duty and delta. Obtain the relation between the two</td><td>3</td><td></td></tr>
</table>

MODULE 4			
1	What is Surcharge storage and Bank storage in a reservoir?	3	KTU 2021
2	Explain any one method of River stage measurement	3	KTU 2021
3	Explain the types of reservoirs	6	KTU Dec 2021
4	Explain the determination of reservoir capacity using Mass curve method	8	
5	What is a Flow duration curve? Explain the procedure to construct the same	6	
6	Explain River Training works	8	
7	Explain the use of current meter for velocity measurement in streams	7	
8	Enlist the factors to be considered in the selection of site for a stream gauging station	3	
9	Explain meandering of rivers	3	
10	Explain the method of determination of useful life of a reservoir.	7	
11	Explain the features of different types of groynes	8	
12	Explain the types of storage reservoirs	6	

MODULE 5			
1	Sketch a cavity type tube well and label its parts	3	KTU Dec 2021
2	Define i) Specific yield ii) Specific retention	3	KTU Dec 2021
3	A well penetrates fully a 12m thick water bearing stratum of soil having coefficient of permeability of 0.007 m/s. The well radius is 11 cm and is to be worked under a drawdown of 5 m at the well face. Calculate discharge from the well. What will be the percentage increase in discharge if the radius of well is doubled? Radius of influence is 300 m in each case	6	KTU Dec 2021
4	Explain Recuperation test for determining yield of open wells	8	KTU Dec 2021
5	Explain the zones of underground water	6	KTU Dec 2021
6	A 35 cm diameter well penetrates 25 m below the water table. The water level in a test well at 80 m is lowered by 0.6 m after 24 hours of pumping at the rate of 6000 l/minute and in a well 35 m away, the drawdown is 1.2 m. Determine a)Transmissibility of the aquifer b) Drawdown in the main well	8	KTU Dec 2021
7	Define (i) Storativity (ii) Transmissibility	3	
8	Explain well losses	3	
9	State Darcy's law and its limitations	4	
10	The following observations were recorded during a pumping out test on a tube well penetrating fully in an aquifer: Well diameter: 25 cm, Discharge from the well: 300 m3 /hr, RL of original water surface before pumping started: 122.000, RL of water in the well at constant pumping: 117.100 , RL of water	10	
	in the observation well: 121.300, RL of impervious layer: 92.000, radial distance of observation well from the tube well: 50 m. Determine : (a) field permeability coefficient of the aquifer (b) radius of zero drawdown		
11	Explain the working of a strainer type tube well with a sketch	7	

CET303 DESIGN OF CONCRETE STRUCTURES

Sl.No.	Question	Marks	Question Paper
	Module 1		
1	Explain how reinforced concrete beams are classified based on neutral axis depth?	3	KTU June 2024
2	What are the assumptions made in limit state of collapse in flexure?	3	KTU June 2024
3	a) Define characteristic load and characteristic strength. b) A singly reinforced beam 400mm wide has an effective depth of 560mm. It is reinforced with 4#18mm diameter HYSD bars of Fe415 grade at an effective cover of 40mm. Classify the section and determine the flexural strength of the beam if M20 grade concrete is used.	4 10	KTU June 2024
4	What are the different kinds of loads to be taken into account for the design of RCC structures? b) Design a singly reinforced rectangular beam of clear span 5.6m simply supported at the ends to carry uniformly distributed live load of 15kN/m. Use M20 concrete and Fe415 grade steel. Assume moderate exposure conditions.	3 11	KTU June 2024
5	Distinguish between balanced, over-reinforced and under-reinforced sections in 3 limit state design.	3	23
6	Sketch the stress strain curve of steel and mark the saliant points.	3	
7	a) Find the moment of resistance of a singly reinforced concrete beam of 300 mm width and 600 mm effective depth, reinforced with 4 bars of l6 mm diameter of Fe 415 steel. Take M 25 concrete. b) Design a singly reinforced rectangular cantilever beam of span 1.5 metres to withstand a factored load of 5 kN/m2.	5 9	
8	a) Derive the expressions for stress block parameters in limit state of flexure and hence the expression for moment of resistance of a singly reinforced rectangular section b) Design a simply supported singly reinforcedrectangulai beam of span 3 metres 7	7	

	to withstand a factored loadof l0 kN/m2.		
9	Explain how design loads are estimated in limit state design? Why should there be limiting values for the amount of tensile reinforcement provided in beams?		Dec22
10	Define partial s'afety factor. Why is partial safety factor for concrete greater than that of steel? (4) A singly reinforced beam 200mm wide [as an effective depth of 400mm. It is reinforced with 3#l6mm diameter HYs bars of Fe4l5 grade. Determine the moment of resistance of the section, if M20 concrete is used. (10)		
11	Define limit state. What are the objectives of limit state design? (:) Design a singly reinforced rectangular beam simply supported over an effective span 7m. The beam has to support a live load of 20kN/m. Use M20 concrete and Fe4l5 grade steel. Assume moderate exposure conditions.	11	
Module 2			
1	Define bond stress and explain how proper bond can be maintained in concrete?		
2	What are the different types of shear failures in reinforced concrete beams?		
3	a) What are the important factors affecting the shear resistance of a reinforced (3) concrete memberwithout shear reinforcement? b) Design a simply supported reinforced concrete beamto support a dead lead of (11) 8kN/m and a live load of 20kN/m in addition to its self-weight over a span of 5m. The maximum overall depth is restricted to 500mm. Use M20 concrete and Fe415 grade steel. Assume an effective cover of 50mm.		
4	Under what circumstances should beams be designed for		

	torsion? b) Determine the moment of resistance of a T beam with effective width of flange1100mm, depth of flange 100mm, web width 300mm and effective depth 450mm. The area of steel reinforcement provided is 2500mm². Use M25 concrete and Fe500 grade		
5	Differentiate between flexural bond and development bon		Dec 23
6	What are the different types of shear reinforcement in a beam		
7	a) Define development length and derive an expression for development length. 4 b) A250 mm wide RC beam with 500 mm depth is reinforced with 4 numbers l6 l0 mm diameter bars of Fe 415 grade steel. Effective cover to reinforcement is 50 mm. The beam is provided with 8 mm diameter 2 legged vertical stimrps at 150 mmc/c as shear reinforcement. M20 concrete is used. Determine the design strength in shear and also its limiting value.		
8	a) Design the shear reinforcement for a beam with b=350 mm, d= 550 mm, l0 Vu: 125 kN, f"r= 25 N/mm2, fr= 415 N/mm2. Percentage of steel is | .67 percent. b) Explain the concept of limit state of collapse in shear and bond.		
9	Enumerate the situations in which a doubly reinforced section become necessary. (3marks, KTU Dec 21)		
10	Explain the term development length and explain its significance in RC design. Obtain the expression for it. (3marks, KTU Dec 21)		
	Explain why and how shear reinforcement is provided in beams. (4marks, KTU Dec 21) b) Design a simply supported rectangular beam to carry a superimposed load of 30kN/mover a span of 5.5m. Assume support width as		

	300mm. Maximum overall depth is restricted to 550mm. Use M20 concrete and Fe 415 grade steel. (10marks, KTU Dec 21)		
Module 3			
1	Define the terms: (i) Going (ii) Nosing	3	KTU June 2024
2	What is the importance of slenderness ratio in columns?	3	KTU June 2024
3	a) Distinguish between one way and two-way slabs b) Design a reinforced concrete floor slab for a room of inside dimensions 4m x 10m and supported on all sides by 40cm thick brick wall. The superimposed load may be taken as 3000N/m². Use M20 concrete and Fe415 grade steel	3 11	KTU June 2024
4	a) What are the various types of staircases based on geometrical configurations? Design a doglegged stair for the following data: b) Rise 150mm. Tread 300mm, No. of steps in a flight 10, width of the landing 150mm. Use M20 concrete and Fe415 grade steel. Assume service live lood of 5kN/m² and stairs to be supported on 230mm thick masonry wall at outer edges of landing parallel to risers.	2 12	KTU June 2024
5	How does load distribution take place in a two-way slab	3	23
6	Explain the effect of restrains in load distribution of continuous slab	3	
7	a) Design an interior panel of a continuous slab system with effective dimensions 4m x 5m subjected to a live load of 3 kN/m2. Use M20 concrete and Fe 415 steel. Draw top plan and bottom plan to show the reinforcement detailing.	14	
8	a) Sketch the reinforcement detailing of a tread-riser type stair. b) Explain the procedure of design of a dog-legged stair	7 7	

	case		
9	a) Explain briefly the need of corner reinforcement in two way restrained slab. (3marks,) b) Design and detail a simply supported slab for a room of interior dimension 5m x 4m subjected to an imposed load of 8kN/m2 . Thickness of supporting wall is 230 mm. Use M 20 concrete and Fe 415 grade steel. (11 marks, KTU Dec 21)		KTU Dec 21
10	a) Discuss the various loads to be considered while designing a staircase. (2 marks, KTU Dec 21) b) Design a staircase to be provided in an office building in two straight opposite flights of 1.35m width connected by a landing for a floor height of 3.3m. The landing which is 1.35m wide spans in the same direction as the stair slab. The rise and tread shall be 150mm and 300mm respectively. The weight of finishes 1kN/m2, live load =5kN/m2 . Use M 20 concrete and Fe 415 grade steel. (12 marks, KTU Dec 21)		KTU Dec 21
11	Distinguish between one way slab and two-way slab. (3 marks, KTU Dec 21)		KTU Dec 21
12	List the different types of staircases based on its geometrical shapes. (3 marks, KTU Dec 21)		KTU Dec 21
	Module 4		
1	a) Explain the classification of columns based on type of reinforcement. b) Design the reinforcement in a spiral column of 400mm diameter subjected to a factored load of 1500kN. The column has an unsupported length of 3.4m and is braced against sideway. Use M25 concrete and Fe 415 steel.	4 10	24
2	a) What are the functions of transverse reinforcement in columns? b) Design the reinforcement for a rectangular column 300 x 600mm subjected to a factored load of 1400kN and factored moment of 280kNm with respect to the major axis. Use M20 concrete and Fe415 grade steel.	4 10	

3	What is the importance of slenderness ratio in columns?	3	
	List the functions of transverse reinforcement in column		23
	Differentiate between short and long Coolum		
4	a) Design the reinforcement in a spiral column of 400 mm diameter subjected to a 14 factored load of l500 kN. The column has an unsupported length of 3.4 m and is braced against sideway. Use M 25 concrete and Fe 415 steel.		
	a) Design a short square column to carry a factored axial load of 3000 kN, using g M 20 concrete and Fe 415 steel. * b) Define slenderness ratio. What are its implications in the design of RC . 5 compression members?		
			22
5	Explain the function of transverse ties in a reinforced concrete column? What happens if ties are not provided? (3marks, KTU Dec 21)		
	What are uniaxially and biaxially loaded columns? (3marks, KTU Dec 21)		
6	a) Explain how interaction curves are used in the design of column. (4marks, KTU Dec 21) b) Design a circular column to carry an axial load of 1000 kN. Use M 20 concrete and Fe 415 steel. Draw a longitudinal section and a cross section showing the reinforcement. (10 marks, KTU Dec 21)		
7	a) Classify the columns separately based on loadings and slenderness ratios. (4marks, KTU Dec 21) b) Design a short column subjected to a factored load of 1400 kN and a factored bending moment of 135 kNm about one axis. The column has an unsupported length of 3.6 m.		

	Use M25 concrete and Fe415 grade steel. (10 marks, KTU Dec 21)		
8	What are the purposes of lateral ties in a column? (KTU,Sep 2020)		
	Differentiate between long and short columns. (KTU,Sep 2020)		
	Design a short column subjected to an axial load of 900kN and a moment of 130kN-m about its major axis. Use M20 concrete and Fe415 grade steel (10 marks, KTU May 22)		
	Explain the interaction diagram of columns (5marks, KTU,Sep 2020)		
9	Design a square column to carry a factored axial load of 1500 kN. Use M20 concrete and Fe415 steel. Draw a longitudinal section and a cross section showing the reinforcement. (KTU,Sep 2020)		
10	Determine the area of longitudinal steel to be provided in a short column of size 600mm x 600mm subjected to a factored load of 1500 kN. Use M20 concrete and Fe415 steel. (KTU,May 2019)		
11	Design a circular short column to carry an axial load of 1000 kN using helical reinforcement. Use M20 concrete and Fe 415 steel. (KTU, DEC 2019)		
12	Design a reinforced concrete column to carry an axial load of 1600 kN. Use M20 concrete and Fe415 steel. The column has unsupported length of 3m and is effectively held in position at both the ends, but not restrained against rotation. (KTU, May 2019)		
13	Compare the behaviour of tied columns with spiral column subject to axial loading. (4 marks, Model Question)		
	Draw four typical strain profiles of a short, rectangular, and symmetrically reinforced concrete column causing collapse subjected to different pairs of Pu and Mu when the depths of the neutral axis are (i) less than the depth of		

	column D, (ii) equal to the depth of column D, (iii) D <xu< ∞ and (iv) xu = ∞. Explain the behaviour of column for each of the four strain profiles. (10 marks, Model Question)		
14	Define slenderness ratio. What are its implications in the design of RC comp members? (KTU DEC 2017)		
	List the functions of transverse reinforcement in column. Sketch various types of transverse reinforcements commonly used. (KTU DEC 2017)		
	Module 5		
1	What is a combined footing? Under what circumstances is it used?	3	
2	Distinguish between ordinary and special moment resistant frames.	3	
3	a) Design a reinforced concrete footing for a rectangular column 300mm x 500mm supporting an ultimate axial load of 1500kN. Safe bearing capacity of the soil is 180kN/m². Adopt M25 concrete and Fe415 grade steel.	14	
4	a) Differentiate between short term and long deflections b) A simply supported beam 300mm x 500mm spans over 6m and is reinforced with 3/20mm diameter bars on the tension side at an effective depth of 450mm. The beam is subjected to a service load of 16kN/m inclusive of self-weight. Using M20 concrete and Fe415, calculate crack width at (a) point directly under reinforcement bar (b) bottom corner of beam (c) point mid-way between two reinforcement bars. Check the beam for limit state of cracking.	2 12	
5	Explain the procedure of limiting deflection in two-way slabs.		
	Explain the procedure for estimation of flexural crack width in reinforced 3 concrete slabs as per Indian standards.		
6	a) How are isolated foundations classified? 4		

	b) Explain the process of ensuring limit states of cracking and deflection in flexural l0 members as per Indian standards with the help of an example.		
7	a) Explain the principles of ductile detailing in the design of earthquake resistant 4 structures. b) Explain lhe principles used in the design ofcombined isolated foundations. l0		
	Explain at what situations a combined footing is recommended. (3 marks, KTU Dec 21)		
8	What are the objectives of earthquake-resistant design of reinforced concrete structures? (3 marks, KTU Dec 21)		
9	a) Distinguish between short term and long termdeflection. (2 marks, KTU Dec 21 b) Design and detail an isolated rectangular footing fora column 400 mm x 600 mm to carry a load of 1500 kN. The SBC of the soil is 180 kN/m2. Use M20 concrete and Fe415 grade steel. (12 marks, KTU Dec 21)		
10	a) List with sketches the different types of shallow footings. (2 marks, KTU Dec 21) b) Design a square footing for an axially loaded columnof 450 mm x 450 mm size. Load on column is 800kN. The safe bearing capacity of soil is 190kN/m2 . Use M20 concrete and Fe415 steel. (12 marks, KTU Dec 21)		
	Under what circumstances a trapezoidal shape is preferred to a rectangular shape for a two column combined footing.	5	KTU May 22
11	Illustrate the design and detailing of an isolated footing of uniform thickness for a rectangular column 300 x 450mm supporting an axial service load of 800kN. Safe bearing capacity of the soil is 200kN/m2 . Use M20 concrete and	15	KTU May 22

	Fe415 grade steel.		