G 1399 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Civil Engineering

CE 010 601—DESIGN OF STEEL STRUCTURES (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Write a note on available structural steel sections.
2. List the classification of columns.
3. Which are the different types of water tanks available.
4. Mention some applications of light gauge steel structures.
5. List the permissible stresses in chimneys.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. List the steps involved in the design of a tension member.
7. Differentiate between slab base and gusseted base.
8. What are the loads to be considered in the design of elevated tanks ?
9. Explain the phenomenon of local buckling in light gauge steel structures.
10. What do you mean by a self supporting chimney ?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Calculate the strength of a 20 mm diameter bolt of grade 4.6 for the following cases. The main plates to be jointed are 12 mm thick :

    (a) Lap joint.

    (b) Single cover butt joint ; the cover plate being 10 mm thick.

    (c) Double cover butt joint ; each of the cover plate being 8 mm thick.

Or

12. Design a laterally unsupported beam for the following data :—

Effective span	:	4 m
Maximum bending moment	:	550 kNm
Maximum shear force	:	200 kN
Steel of grade	:	Fe 410

13. Design a built-up column 9 m long to carry a factored axial compressive load of 110 kN. The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back-to-back. Use steel of grade Fe410.

Or

14. A column ISHB 350 at 661.2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections.

15. Design the overhead portion of a rectangular tank of 80,000 litres capacity.

Or

16. Design the elevated position of a cylindrical steel tank with hemispherical bottom for 1,60,000 litres capacity. The tank has conical roof. Take f_y = 250 N/mm^2.

17. A square box section 200 mm × 200 mm × 2 mm is to be used as a column of effective length 4 m. Find the maximum load it can carry.

Or

18. Design a beam to span 5 m carrying a load inclusive of self-load of 1000 N/m. The ends of the beam are unrestrained against lateral bending.

19. Design a self-supporting chimney of 100 m height. The diameter of cylindrical shell is 4 m. The chimney has a 100 m thick brick lining supported on the shell.

Or

20. Which are the different types of steel chimneys ? Explain in detail the forces acting on steel chimneys.

(5 × 12 = 60 marks)

G 1437 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Civil Engineering

CE 010 604—TRANSPORTATION ENGINEERING—I (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. List the characteristics of highway and railway ?
2. What is meant by coning of wheels ?
3. Can you make a distinction between Points and Crossings ?
4. What is the theme of jetties ?
5. Define dry docks.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Compare wear and creep of rails ?
7. Draw the main function of Signaling.
8. Explain tunnel surveying.
9. Discuss necessity and functions of Break waters.
10. Assess the importance of floating dry docks ?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Give a description about Modern developments in Railway track.

Or

12. Explain Component parts of a railway track ?

Turn over

13. Discuss the Control systems of train movements with detail explanation.

Or

14. Illustrate the Details of station yards and marshalling yards.

15. Write in detail about shield method of tunneling.

Or

16. Explain the lighting and drainage of tunnels.

17. Discuss the classification and requirements of design of harbour.

Or

18. Explain the necessity and functions of lighthouses.

19. Write short notes on :

    (a) Dry docks ;

    (b) Wet docks ;

    (c) Dock entrances.

Or

20. Explain distinction between ladder dredger and hydraulic dredger.

(5 × 12 = 60 marks)

G 1472 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

CE 010 606 L05—CONCRETE TECHNOLOGY (Elective I) [CE]

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What is alkali aggregate reaction ?
2. What is meant by curing of concrete ?
3. List the factors affecting modulus of elasticity of concrete.
4. Define characteristic compressive strength.
5. Write short notes on sulphur infiltrated concrete.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the significance of transition zone in concrete.
7. Define and explain the workability of concrete. What are the factors affecting it ?
8. What is the effect of maximum size of aggregate on strength of concrete ?
9. List out the indirect methods of determining the tensile strength of concrete. Explain any *one* of them.
10. Write short notes on light weight concrete.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) With a neat sketch of the apparatus, explain the test for determining the standard consistency of cement. (5 marks)

Turn over

(b) Define elongation index of coarse aggregate. Explain the IS code method to determine the elongation index of coarse aggregate. (7 marks)

Or

12. (a) Define hydration of cement. Explain any three types of cement and its uses. (5 marks)

(b) Explain grading of aggregate and its significance. (7 marks)

13. (a) What are the qualities of water required for mixing and curing of concrete ? (5 marks)

(b) Explain seggregation and bleeding of concrete. (7 marks)

Or

14. (a) List the various methods of determining the workability of concrete. Explain in detail any one method used in the field to determine workability of concrete. (5 marks)

(b) Write short notes on (i) retarders and (ii) damp proofing agents. (7 marks)

15. (a) Explain in detail the various factors affecting the strength of concrete. (5 marks)

(b) Explain the maturity concept of concrete. (7 marks)

Or

16. (a) What are the different modulii of elasticity of concrete ? List the factors affecting modulus of elasticity of concrete. (5 marks)

(b) Write short notes on : (i) Creep of concrete ; and (ii) Shrinkage of concrete. List the factors affecting each of them. (7 marks)

17. (a) Explain the IS code method of concrete mix design. (5 marks)

(b) What are the methods of controlling sulphate and chloride attack on concrete ? (7 marks)

Or

18. (a) Write short notes on the action of organic acids and mineral oils on hardened concrete. (5 marks)

(b) Write short notes on durability of concrete. (5 marks)

19. Write short notes on any *four* :

(i) Artificial aggregate. (ii) High density concrete.

(iii) Polymer cement concrete. (iv) No-fine concrete.

(v) Fibre reinforced concrete.

(4 × 3 = 12 marks)

Or

20. Explain in detail any *three* special concreting methods.

[5 × 12 = 60 marks]

G 1452 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Civil Engineering

CE 010 605—WATER RESOURCES ENGINEERING (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Assume any data not mentioned suitably.

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. List the various systems of irrigation practiced.
2. The presentation of rainfall data at a rain gauge station is to be made. Discuss any two procedures used.
3. Differentiate between a confined and unconfined aquifer.
4. State the requirements of a good canal outlet.
5. List down the structural and non-structural measures used in flood control.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Comment on the variation of duty from the head of a main canal to field water course with justification.
7. State the influence of the following parameters on the run-off hydrograph :
   (i) shape of basin ;
   (ii) drainage density.
8. Sketch the strainer type of tube well. Indicate the salient features of it and its suitability in field.
9. Illustrate the classification of canals based on alignment.
10. Differentiate between hydraulic and hydrologic routing.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. (a) Compute the depth and frequency of irrigation required for a certain crop with the data given below. Root zone depth = 100 cm, Field capacity of soil = 22 %, wilting point of soil = 12 %, Apparent specific gravity of soil = 1.5 gram/cm^3. Consumptive use = 30 mm/day, irrigation efficiency = 60 %. Assume 50 % depletion of soil moisture before application of water.

(8 marks)

(b) Give the typical layout of an irrigation scheme indicating the components. (4 marks)

Or

12. (a) For a branch canal the Gross command area is 10 km^2, and the cultivable command area is 80 % of gross command area. The intensity of irrigation is 40 % for wheat and 20 % for rice. If the kor period for wheat and rice are 22 days and 18 days respectively, determine the discharge required, neglecting the losses. Assume depth of kor watering for wheat and rice are 10 cm and 20 cm respectively.

(7 marks)

(b) Briefly discuss a method for the estimation of consumptive use of a crop grown in an irrigated area of a canal.

(5 marks)

13. The ordinates of the 2 hour unit hydrograph (In 2 hour intervals from zero to 22 hours) of a basin are as follows : 0, 25, 100, 160, 190, 170, 110, 70, 30, 20, 6, 0. Determine the ordinates of 5 curve hydrograph. Using the S curve, determine the ordinates of a 3 hour flood hydrograph. Assume a constant base flow of 5 cumecs.

(12 marks)

Or

14. (a) The isohyets due to a storm in a catchment were drawn and the area of the catchment bounded by the isohyets were tabulated as follows :

Isohyets (mm) ...	Station – 120	120 – 100	100 – 80	80 – 60	60 – 40	40 – 20
Area (km^2) ...	40	150	70	170	50	20

Estimate the mean precipitation due to the storm.

(6 marks)

(b) The mass curve of rainfall of duration 100 minutes is given below. If the catchment had an initial loss of 0.6 cm and a $\varnothing$-index value of 0.6 cm/hour, calculate the total surface run-off from the catchment.

Time from start of rainfall (minutes) ...	0	20	40	60	80	100
Cumulative rainfall (cm) ...	0	0.5	1.2	2.6	3.3	3.5

(6 marks)

15. During the recuperation test of a 3.5 m diameter open well a recuperation of the depression head from 2.4 m to 1.2 m was found to take place in 80 minutes. Determine the :

(i) specific capacity per unit well area and ;

(ii) yield of the well for a safe draw down of 2.4 m ;

(iii) What would be the yield from a well of 4.5 m diameter for a drawdown of 2,2 m ?

Or

16. A 30 cm diameter well completely penetrates an unconfined aquifer of saturated depth 25 m. When a discharge of 2100 litres/minute was being pumped for a long time, observation wells at radial distances of 30 and 90 m indicated a drawdown of 5 m and 4 m respectively. Estimate the co-efficient of permeability and transmissibility of the aquifer. What is the drawdown at the pumping well ? State the Equation used for solving the problem, indicating the assumptions.

17. Design an irrigation canal in alluvial soil (cross sectional parameters and bed slope) using Kennedy's theory to carry a discharge of 15 cumecs. Assume Kutter's n = 0.023, critical velocity ratio = 1.05. Use bottom width to depth ratio for the channel section as 5.8,

Or

18. Explain the permanent regime concept put forward by Lacey's theory. A channel section is to be designed for the following data : Discharge = 30 cumecs, silt factor = 1.1, side slope = 0,5 : 1. Determine the cross sectional parameters and the longitudinal slope of canal using Lacey's theory.

19. (a) List the methods for controlling reservoir sedimentation. (4 marks)

(b) The average monthly inflows in m^3/s units, for a water year (June to May), into a reservoir is given below: 20, 60, 200. 300, 200, 150, 100, 80, 60, 40, 30, 25. If a uniform discharge of 90 m^3/s is desired from the reservoir, what is the minimum storage capacity required.

(8 marks)

Or

20. (a) A flood of 5000 cumecs in a certain river has a return period of 40 years :

(i) What is its probability of exceedance ?

(ii) What is the probability that a flood of 5000 cumecs or greater magnitude may occur in the next 20 years ?

(iii) What is the probability occurrence of a flood of magnitude 5000 cumecs ?

(6 marks)

(b) Briefly explain with sketches the use of guide banks and groynes for river training works.

(6 marks)

[5 × 12 = 60 marks]

G 1411 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Civil Engineering

CE 010 602—GEOTECHNICAL ENGINEERING—II (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

1. What is bore log ? Explain its significance in site investigation.
2. Discuss briefly about the types and uses of sheet pile walls.
3. Comment on the effects of water table variations in Terzaghi's bearing capacity equation.
4. Enumerate the steps involved in selecting the type of foundation for a building.
5. What is meant by a floating foundation ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Briefly explain the geophysical methods employed in sub surface investigations.
7. Explain the Culman's graphical method for the computation of lateral earth pressure.
8. Write down the equations commonly employed to compute the immediate and consolidation settlements clearly explaining the terms involved.
9. Differentiate between the shallow and deep foundations clearly explaining the functions of each.
10. With neat sketches, explain the construction details of a well foundation.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Three concentrated loads of 3000 kN, 1000 kN and 2000 kN, spaced at 4.5 m and 3.5m between the first and the second and the second and the third loads, are acting in one vertical plane at the surface of a soil mass. Calculate the resultant vertical stress produced by these loads on a horizontal plane 1.5 m below the surface, at points directly below the loads and also halfway between them. Plot the curve showing the vertical stress distribution.

Or

Turn over

12. A concentrated load of 200 kN acts at foundation level at a depth of 2 m below ground surface. Find the vertical stress along the axis of the load at a depth of 10 m and at a radial distance of 5 m at the same depth by : (a) Boussinesq and (b) Westergaard formulae for $n = 0$. Neglect the depth of the foundation.

13. Use the Rankine method to calculate the total active lateral force and location of the forces behind a 3.5 m high vertical wall. Assume that the soil has a total unit weight of 18 kN/m^3 and a friction value of 32 degrees. Assume that there is a uniform surcharge of 10 kPa located along the surface behind the wall. Groundwater is well below the depth of the foundation so that pore pressure does not develop behind the wall.

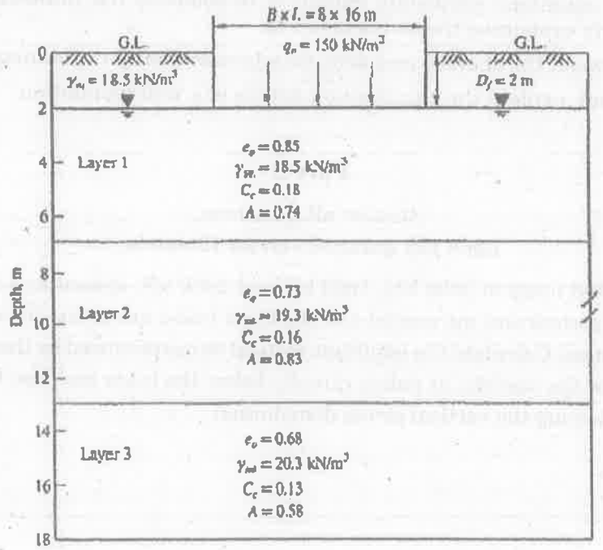
Or

14. A cantilever retaining wall of 7 metre height retains sand. The properties of the sand are : $e = 0.5$, friction angle = 30° and G = 2.7. Using Rankine's theory determine the active earth pressure at the base when the backfill is : (i) dry ; (ii) saturated and (iii) submerged, and also the resultant active force in each case. In addition determine the total water pressure under the submerged condition.

15. A strip footing of width 3 m is founded at a depth of 2 m below the ground surface in a $(c - \varphi)$ soil having a cohesion c = 30 kN/m^2 and angle of shearing resistance $\varphi = 35°$. The water table is at a depth of 5 m below ground level. The moist weight of soil above the water table is 17.25 kN/m^3. Determine : (a) the ultimate bearing capacity of the soil ; (b) the net bearing capacity ; and (c) the net allowable bearing pressure and the load/m for a factor of safety of 3. Use the general shear failure theory of Terzaghi.

Or

16. It is proposed to construct an overhead tank on a raft foundation of size 8 m × 16m with the foundation at a depth of 2 m below ground level. The subsoil at the site is stiff homogeneous clay with the water table at the base of the foundation. The subsoil is divided into 3 layers and the properties of each layer are given in Fig. Estimate the consolidation settlement by the Skempton-Bjerrum Method.



17. A square footing is to be constructed on a deep deposit of sand at a depth of 0.9 m to carry a design load of 300 kN with a factor of safety of 2.5. The ground water table may rise to the ground level during rainy season. Design the plan dimensions of the footing. Assume saturated unit weight is 20.8 kN/m^3, N_c = 25, N_q = 34 and N_γ = 32.

Or

18. The end column along a property line is connected to an interior column of the same size by a trapezoidal footing. The column loads are Q1 = 2016 kN for the end column and Q2 = 1560 kN for the interior column. Size of columns : 0.46 × 0.46 m. The effective spacing between the columns is 5.48 m. Determine the end dimensions of the trapezoidal footing. The net allowable bearing pressure q_{na} =190 kPa.

19. A concrete pile of 45 cm diameter is driven through a system of layered cohesive soils. The length of the pile is 16 m. The following data are available. The water table is close to the ground surface. Top layer 1 : Soft clay, thickness = 8 m, unit cohesion c_u = 30 kN/m^2 and adhesion factor $\alpha = 0.90$., Layer 2 : Medium stiff, thickness = 6 m, unit cohesion c_u = 50 kN/m^2 and $\alpha = 0.75$. Layer 3 : Stiff stratum extends to a great depth, unit cohesion c_u = 105 kN/m^2 and $\alpha = 0.50$. Compute Qu and Qa with Fs = 2.5.

Or

20. A mat foundation on saturated clay soil has dimensions 20m × 20 m. Given dead and live load = 48 MN, c_u = 30 kN/m^2, γ_{clay} = 18.5 kN/m^3

    (a) Find the depth, Df of the mat for fully compensated foundation

    (b) What will be the depth of the mat (Df) for a factor of safety of 2 against bearing capacity failure ?

(5 × 12 = 60 marks)

16. Determine the influence line for reaction at A for the continuous beam shown in Figure 4. Compute the influence line ordinates at 1 m intervals :

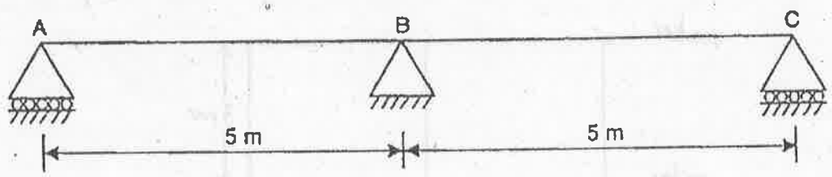


Figure 4

17. Given the following state of stress :

$$[\sigma] = \begin{bmatrix} 100 & 50 & 150 \\ 50 & 0 & 0 \\ 150 & 0 & 0 \end{bmatrix}.$$

Find the principal stresses and the principal axes.

Or

18. Prove that the following equations holds for plane stress and plane strain with constant body forces :

$$\nabla^2 (\sigma_{xx} + \sigma_{yy}) = 0.$$

19. Determine the equivalent stiffness of the system shown in Figure 5 :

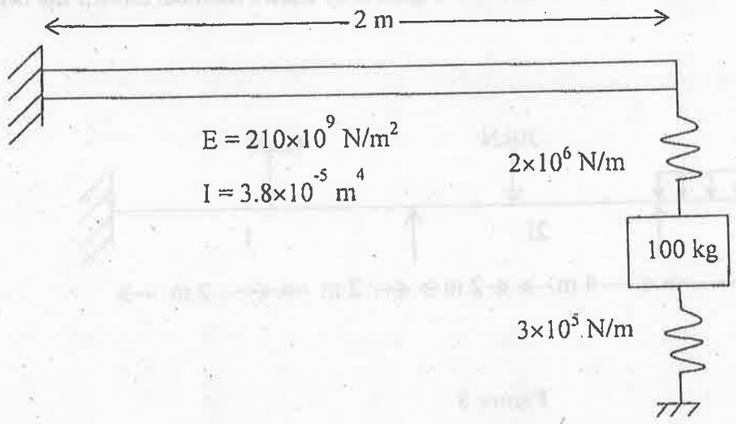


Figure 5

Or

20. A 200 kg machine is placed at the end of 1.8 m long steel ($E = 210 \times 10^9$ N/m^2) cantilever beam. The machine is observed to vibrate with a natural frequency of 21 Hz. What is the moment of inertia of the beam's cross-section about its neutral axis.

(5 × 12 = 60 marks)

G 1423

(Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Civil Engineering

CE 010 603—STRUCTURAL ANALYSIS–II (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Explain the term plastic moment of a section.
2. What is a substitute frame ?
3. State Muller Breslau's principle and its significance.
4. Explain plane strain with an example.
5. State and explain D'Alembert's principle.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Define shape factor and determine the shape factor for a rectangular section of size $b \times d$.
7. Explain cantilever method with an example.
8. Distinguish between bending moment diagram and influence line for bending moment.
9. State and explain the compatibility equations for 2D problems.
10. Derive an expression for the equivalent stiffness of springs connected in parallel.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. (a) Write short notes on : (i) plastic hinge ; and (ii) load factor. (5 marks)

(b) Determine the shape factor for the beam section shown in Figure 1. Find also the fully plastic moment of the beam section. Take $\sigma_y = 250\ N/mm^2$.

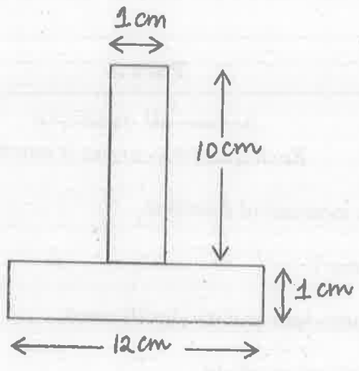


Figure 1

(7 marks)

Or

12. A beam of AB of span ℓ fixed at both ends has to carry a point load at a distance ℓ /3 from the left end. Find the value of the load at the collapse condition if the plastic moment of resistance of the left half of the beam is $2M_p$ while the plastic moment of resistance of the right half of the beam is M_p.

13. Analyse the plane frame shown in Figure 2 by cantilever method :

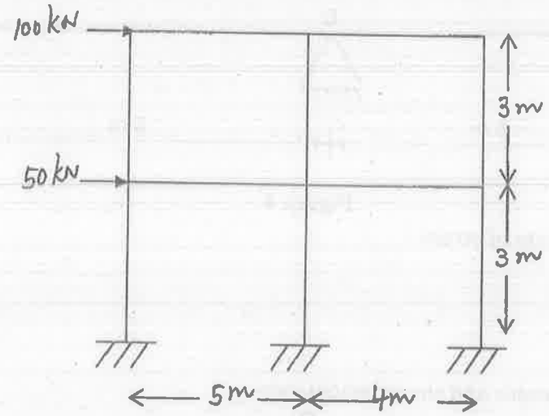


Figure 2

Or

14. Explain the tension coefficient method of analysing space frames with an example.

15. Analyse the continuous beam loaded as shown in Figure 3 by Kani's method. Sketch the bending moment diagram :

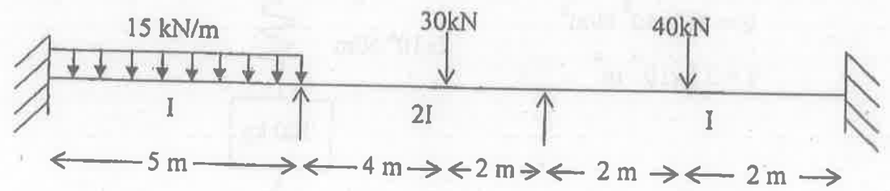


Figure 3

Or