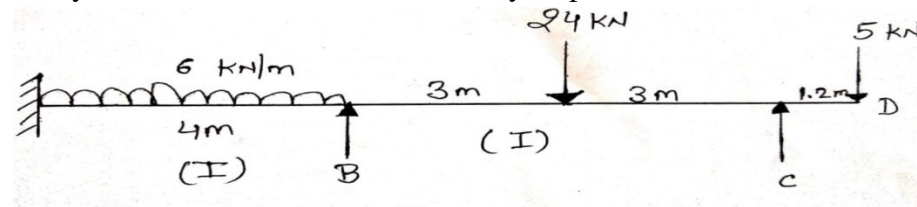
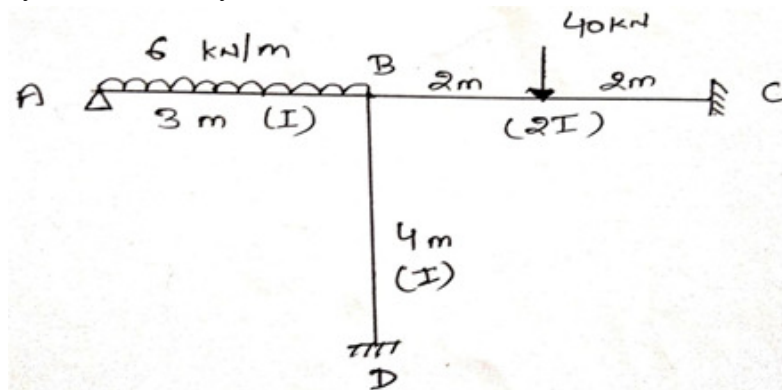


- ii. Analyse the continuous beam ABCD by slope deflection method. 5



- iii. Analyse the frame by moment distribution method. 5



- Q.6 i. What do you mean by suspension bridges? Write name of various parts of suspension bridge. 3
- ii. A three-hinged parabolic arch of span 20 m and rise 4 m carries a UDL of 20 kN per metre run on the left half of the span. Find the maximum positive and negative bending moment for the arch. 7
- OR iii. A cable is supported between two points 30 m horizontally apart. The left support is 3 m above the right support. The cable carries a load of 2 kN/m on the horizontal span. The lowest point of the cable is 6 m below the left support. Find the maximum tension in the cable. 7



Programme: B.Tech.

Enrollment No.....


Faculty of Engineering
End Sem (Even) Examination May-2019
CE3CO06 Structural Analysis –I

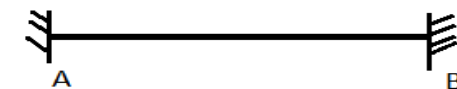
Branch/Specialisation: CE

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Number of equilibrium equation for a 3-D structure is: 1
(a) Four (b) Three (c) Six (d) Zero
- ii. The kinematic indeterminacy of beam is: 1

(a) 3 (b) 2 (c) 1 (d) 0
- iii. Resilience can also be termed as ____ 1
(a) Stress energy (b) Strain energy
(c) Modulus (d) Tenacity
- iv. By the law of conservation of energy, strain energy stored is equals to 1
(a) Modulus (b) Work done (c) Stress (d) None of these
- v. In influence line diagrams (ILD): 1
(a) Points remain fixed, position of load changes
(b) Points change, position of loads remains fixed
(c) Neither of them changes
(d) Both of them changes
- vi. A single rolling load of 18 kN rolls along a girder of 15 m span. The maximum bending moment at 5 m from left hand support will be 1
(a) 18 kN.m (b) 15 kN.m (c) 6 kN.m (d) None of these
- vii. In figure if support B settles by 1mm downward, what is direction of rotation at point A 1



- (a) +ve (b) -ve
(c) Can't say (d) Depends on loading at A

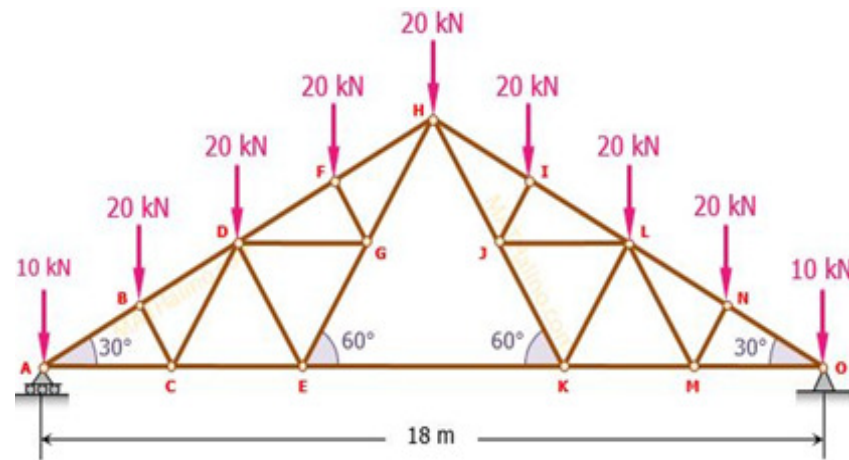
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[2]

- viii. In the slope deflection equations, the deformations are considered to be caused by
 (a) Bending moment (b) Shear force
 (c) Axial force (d) None of these
- ix. Top most part of an arch is called _____
 (a) Soffit (b) Crown (c) Abutment (d) Centre
- x. What is the degree of indeterminacy of a two hinged arch?
 (a) 1 (b) 2 (c) 3 (d) 4

- | | | | |
|-----|-----|--|---|
| Q.2 | i. | Differentiate between determinate and indeterminate structure. | 4 |
| | ii. | A continuous beam ABCD 16 m long is simply supported at A, B, C and D. The beam consists of span AB, BC and CD of lengths 4 m, 6 m, and 6 m respectively. It carries a point load 64 kN on the span AB at a distance of 1 m from A, a load of 45 kN on the span BC at a distance of 2 m from B and a uniformly distributed load of 12 kN/m on the span CD. Find the support moments and reactions by using three moment theorem. Draw also B.M diagrams. | 6 |

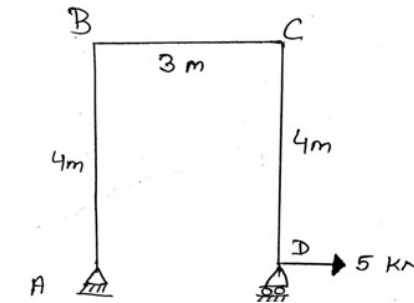
- OR iii. Calculate the force in members GH, EK and FH of truss by method of section and also describe nature of forces. 6



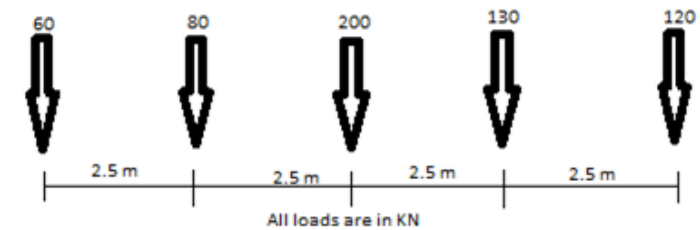
- Q.3 i. (a) State the Maxwell's reciprocal theorem with the help of diagram. 4
(b) Define principle of virtual work.
ii. Using strain energy method determine the deflection of the free end of 6
a cantilever of length 'L' subjected to a concentrated load 'P' at free
end.

[3]

- OR iii. Determine the horizontal displacement of the roller end at joint D of given portal frame. EI is 8000 kNm² throughout. 6

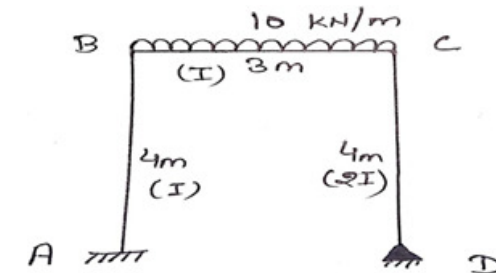


- | | | | |
|-----|-----|--|---|
| Q.4 | i. | Write down applications of ILD. | 2 |
| | ii. | A train of 5 wheel-loads as shown in diagram crosses a simply supported beam of span 22.5 m. Calculate the maximum positive and maximum negative shear force value of the centre of the span and the absolute maximum bending moment anywhere in the span. | 8 |



- OR iii. A live load of 80 kN per metre moves on a simply supported girder of span 12 metres. Find the maximum positive and maximum negative shear force and maximum bending moment which can occur at a section 4 metres from the left end. **8**

- Q.5 Attempt any two:
- i. Analyse the portal frame ABCD loaded as shown in diagram and draw the bending moment diagram by moment distribution method. **5**



Marking Scheme
CE3CO06 Structural Analysis –I

Q.1	i.	Number of equilibrium equation for a 3-D structure is:	1		
		(c) Six			
	ii.	The kinematic indeterminacy of beam is:	1		
		(b) 2			
	iii.	Resilience can also be termed as ____	1		
		(b) Strain energy			
	iv.	By the law of conservation of energy, strain energy stored is equals to	1		
		(b) Work done			
	v.	In influence line diagrams (ILD):	1		
		(d) Both of them changes			
	vi.	A single rolling load of 18 kN rolls along a girder of 15 m span. The maximum bending moment at 5 m from left hand support will be	1		
		(d) None of these			
	vii.	In figure if support B settles by 1mm downward, what is direction of rotation at point A	1		
		(a) +ve			
	viii.	In the slope deflection equations, the deformations are considered to be caused by	1		
		(a) Bending moment			
	ix.	Top most part of an arch is called _____	1		
		(b) Crown			
	x.	What is the degree of indeterminacy of a two hinged arch?	1		
		(b) 2			
Q.2	i.	Differentiate between determinate and indeterminate structure.	4		
		1 mark for each point (1 mark * 4)			
	ii.	Draw also B.M diagrams.	6		
		For correct diagram	1 mark		
		For correct maximum moments	1 mark		
		For correct three moment equation for each span	2 marks		
		For correct calculation	1 mark.		
		For correct BMD	1 mark		
OR	iii.	Calculate the force in members GH, EK and FH of truss by method of section and also describe nature of forces.	6		
		For correct reaction	1 mark		
		For correct distances of X, Y,Z	1.5 marks		
		For correct equilibrium equation on each joint			
		1 mark for each joint (1 mark * 3)	3 marks		
		For correct nature of force description	0.5 mark		
Q.3	i.	(a) State the Maxwell's reciprocal theorem with the help of diagram	4		
		Diagram	1 mark		
		Statement	1 mark		
		(b) Define principle of virtual work.	2 marks		
	ii.	Using strain energy method determine the deflection of the free end of a cantilever of length 'L' subjected to a concentrated load 'P' at free end.	6		
		For correct diagram	1 mark		
		For correct formula of strain energy	1 mark		
		For correct value of strain energy	1 mark		
		For applying law of conservation of energy	2 marks		
		For correct answer	1 mark		
OR	iii.	Determine the horizontal displacement of the roller end at joint D of given portal frame.	6		
		For bending moment expression table	3 marks		
		Strain energy formula	1 mark		
		Work done formula	1 mark		
		Correct answer	1 mark		
Q.4	i.	Applications of ILD.	2		
		At least four points 0.5 mark for each application (0.5 mark * 4)			
	ii.	Calculate the maximum positive and maximum negative shear force value of the centre of the span and the absolute maximum bending moment anywhere in the span.	8		
		Correct diagram for Max positive and negative Shear force and B.M.			
		1 mark for each (1 mark * 3)	3 marks		
		For correct formula			
		1 mark each (1 mark * 3)	3 marks		
		For correct SFD and BMD	1 mark		
		For correct Answer with sign	1 mark		
	OR	iii.	Find the maximum positive and maximum negative shear force and maximum bending moment which can occur at a section 4 metres from the left end.	8	
			Correct diagram for Max positive and negative Shear force and B.M.		
			1 mark for each (1 mark * 3)	3 marks	
			For correct formula		
			1 mark each (1 mark * 3)	3 marks	
			For correct SFD and BMD	1 mark	
			For correct Answer with sign	1 mark	

- Q.5 Attempt any two:
- i. Analyse the portal frame ABCD loaded as shown in diagram and draw the bending moment diagram by moment distribution method. **5**

For correct fixed end moments	1 mark
For correct distribution factor table	1 mark
For correct calculation of balancing moment	2 marks
For correct BMD	1 mark
 - ii. Analyse the continuous beam ABCD by slope deflection method. **5**

For correct fixed end moments	1 mark
Slope deflection equation for each span	
½ mark for each span (½ mark *4)	2 marks
Correct equilibrium equation for joints	1 mark
Correct answer	1 mark
 - iii. Analyse the frame by moment distribution method. **5**

For correct fixed end moments	1 mark
For correct distribution factor table	2 marks
For correct calculation of balancing moment	2 marks
- Q.6
- i. Proper definition suspension bridges 1.5 marks **3**
 Name of various parts of suspension bridge
 At least three name 0.5 mark for each (0.5 mark *3) 1.5 marks
 - ii. Find the maximum positive and negative bending moment for the arch. **7**

For correct diagram	1 mark
For correct formula 1 mark each (1 mark * 2)	2 marks
For correct value of x and y	
1 mark each (1 mark * 2)	2 marks
For correct value of horizontal thrust	1 mark
Correct answer	1 mark
- OR
- iii. Find the maximum tension in the cable. **7**

For correct diagram	1 mark
For correct formula – 1 mark each(1 mark * 2)	2 marks
For correct value of x and y	
1 mark each (1 mark * 2)	2 marks
For correct value of horizontal thrust and reaction	1 mark
Correct answer	1 mark
