University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **CIVIL ENGINEERING**

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: CEC-402 and Course Name: Structural Analysis

Time: 2 hour Max. Marks: 80

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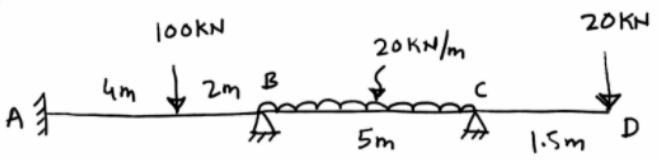
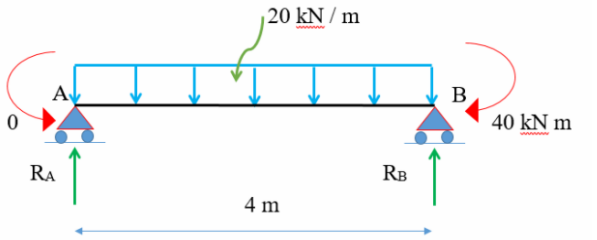
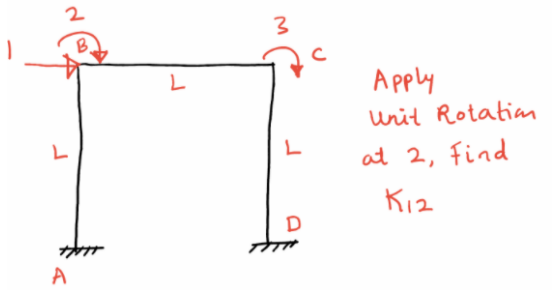
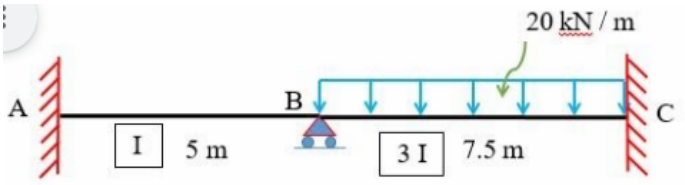
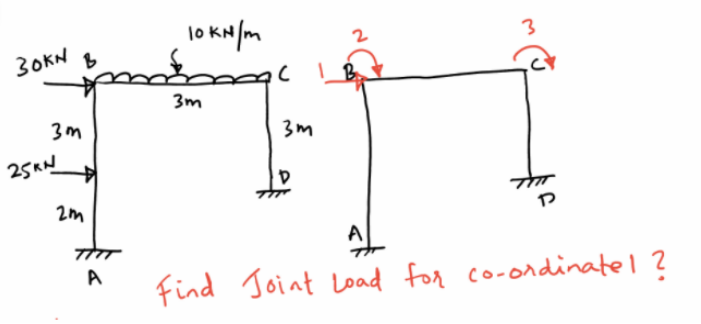
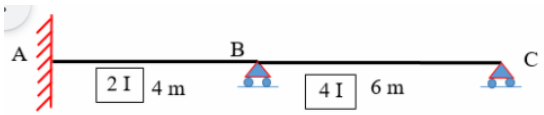
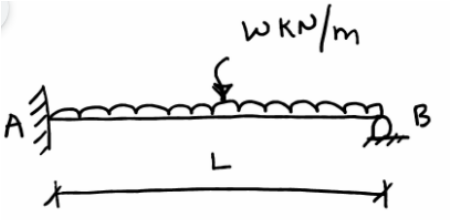
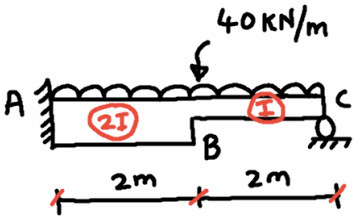
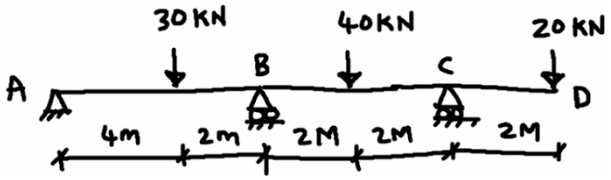
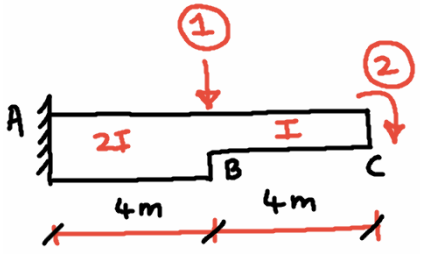
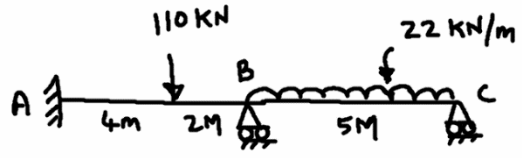
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Choose the correct formula from the option to find number of plastic hinges in the beam. (Where Ds – Degree of statical Indeterminacy, PH - plastic hinges)
Option A:	No. of PH = Ds+2
Option B:	No. of PH = Ds+1
Option C:	No. of PH = Ds
Option D:	No. of PH = Ds+3
2.	In plastic Analysis what factor is multiplied with working load.
Option A:	Load factor
Option B:	Safety factor
Option C:	Partial Load factor
Option D:	Partial Safety Factor
3.	In plastic analysis, where plastic hinges will be formed from following options.
Option A:	Hinged support (Support at End)
Option B:	Roller Support (Support at End)
Option C:	At a Junction, where moment of inertia is changing.
Option D:	At Internal Hinge.
4.	Plastic hinge is formed in a section,
Option A:	When entire section is subjected to yield stress.
Option B:	When top and bottom portion of section is subjected to yield stress.
Option C:	When only compression region of the section is subjected to yield stress.
Option D:	When only tension region of the section is subjected to yield stress.
5.	Find the fixed end moment for AB for the beam shown in figure by considering given loading and also sinking of support B. Support B sink by 15 mm. E= 200 x 10^5 kN/m^2, I = 120 x 10^{-6} m^4 
Option A:	-50.22 kN-m
Option B:	-50.44 kN-m
Option C:	-44.44 kN-m

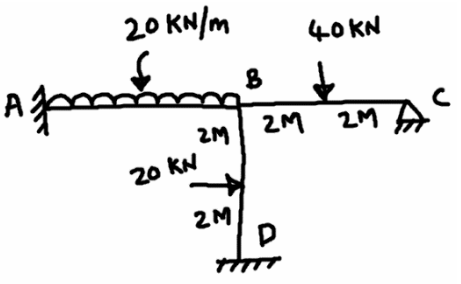
Option D:	44.44 kN-m
6.	In Flexibility method of analysis how many Redundant forces can be derived from Propped Cantilever?
Option A:	4
Option B:	3
Option C:	1
Option D:	2
7.	How many internal forces will be developed in a member of simple pin jointed frame (Trusses)?
Option A:	2
Option B:	1
Option C:	3
Option D:	4
8.	What is the meaning of Flexibility co-efficient fij?
Option A:	force at i due to unit displacement at j
Option B:	force at j due to unit displacement at i
Option C:	displacement at i due to unit load at j
Option D:	displacement at j due to unit load at i
9.	If after Three moment theorem analysis following is the Free Body Diagram, what is the reaction at A? 
Option A:	40 Kn
Option B:	30 kN
Option C:	15 kN
Option D:	45 kN
10.	Find the stiffness co-efficient k_{12} for the rigid jointed frame as shown in figure 
Option A:	$6EI/L^2$
Option B:	$-6EI/L^2$
Option C:	4EI/L
Option D:	2EI/L

11.	If DF (BA) = 0.33 and DF (BC) = 0.67, what is the Bending Moment at B? (DF = Distribution Factor) Choose closest answer. 
Option A:	BM at B = 67.5 kN m
Option B:	BM at B = 92.3 kN m
Option C:	BM at B = 31.25 kN m
Option D:	BM at B = 83.2 kN m
12.	The structure is said to be statically determinate when:
Option A:	Equilibrium condition are insufficient for determining internal forces and reactions
Option B:	Equilibrium condition are sufficient for determining internal forces and reactions
Option C:	Structure is unstable
Option D:	Structure is unsymmetrical
13.	Find the degree of kinematical indeterminacy of the following beam. 
Option A:	5
Option B:	7
Option C:	3
Option D:	2
14.	If a two hinged parabolic arch is subjected to uniformly distributed load w kN/m over entire span, then what is bending moment developed at any section of two hinged Arch.
Option A:	$wl^2/8$
Option B:	$wl^2/2$
Option C:	Zero
Option D:	$wl^2/3$
15.	Which of the following option is indirect load which at times act on structures and develop internal forces and displacement of structure?
Option A:	Uniformly varying load
Option B:	Multiple point loads
Option C:	Difference in temperature between inside and outside of structure
Option D:	Torsion
16.	What is the Area of BMD, when a simply supported beam of span 5m is subjected to uniformly distributed load of intensity 20 kN/m over the Entire Span?
Option A:	208.33
Option B:	210.33
Option C:	206.33

Option D:	204.33
17.	Left figure shows the loading on frame, figure on right shows degrees of freedom with numbers. If it is analyzed by Stiffness method what could be joint load for co-ordinate 1? 
Option A:	30kN
Option B:	-10kN
Option C:	25kN
Option D:	-30kN
18.	Which of the following is correct with reference to Distribution Factor (DF)? Choose closest answer. 
Option A:	DF (BA) = 0.62 and DF (BC) = 0.38
Option B:	DF (BA) = 0.5 and DF (BC) = 0.5
Option C:	DF (BA) = 0.38 and DF (BC) = 0.62
Option D:	DF (BA) = 0.76 and DF (BC) = 0.24
19.	If the Total Degree of Static Indeterminacy is NEGATIVE, which of the following is correct?
Option A:	Structure is over stable (Internal as well as External)
Option B:	Structure is just Stable (Internal as well as External)
Option C:	Structure is Unstable (Overall)
Option D:	Structure is externally unstable but internally stable
20.	For a given figure, one plastic hinge will be formed at A. At what distance from B another plastic hinge is formed. 
Option A:	0.586 L
Option B:	0.486 L
Option C:	0.414 L
Option D:	0.514L

Q2.	Solve any two out of three 10 Marks each
A	Analyze the propped shown in figure by force method (flexibility method). Draw Bending moment Diagram. 
B	Analyze the continuous beam as shown in figure by three moment Equations (Clapeyron's Method). Draw Bending Moment Diagram. 
C	Develop flexibility matrix for the co-ordinates shown in figure. 

Q3.	Solve any two out of three each 10 Marks
A	Analyze the continuous beam by slope deflection method as shown in figure. EI is constant. Draw BMD. 

B	For the given frame in figure, analyze it by moment distribution method. Draw BMD. EI is constant. 
C	A parabolic arch ABCD of span 40m and central rise of 4m is hinged at its ends and third hinge is provided in the arch rib at right quarter span at point D. It carries udl of 15kN/m in left half portion AC along with a point load of 25kN at hinge D. Find i) Normal thrust and Radial Shear force ii) Max BM and its location in part AC