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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Civil Engineering

Semester End Examination; July / August - 2022

Basic Structural Analysis

Time: 3 hrs *Max. Marks: 100*

Course Outcome

The Students will be able to:

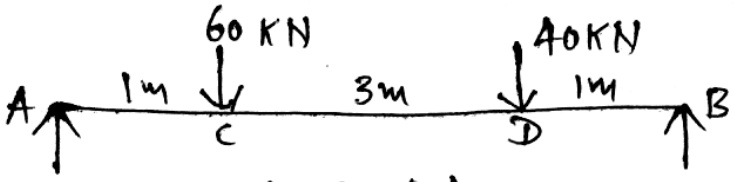
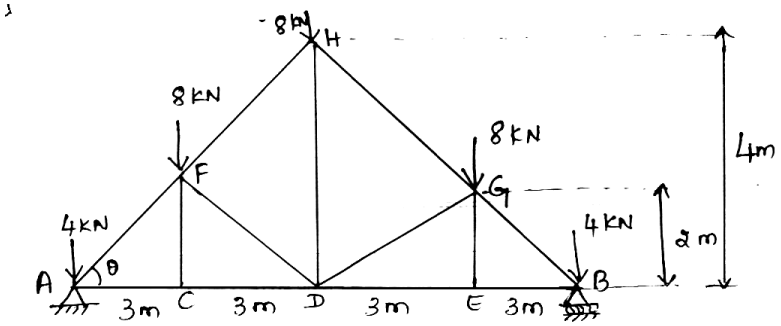
CO1: Identify, formulate and solve problems on frames, trusses, cables and arches.

Co2: Compute the deflections of determinate beams by Macaulay's method, moment area method and conjugate beam

CO3: Interpret the influence line diagram to analyze beams under moving loads.

CO4: Analyze statically indeterminate beams using strain energy, consistent deformation and theorem of three moments

***Note**: i) **PART-A** is compulsory. One question from each unit for maximum of TWO marks*
*ii) **PART-B**: Answer any **TWO** sub questions (from a, b, c) from each unit for a Maximum of 18 marks.*

Q. No.		Questions	Marks	BLs	COs
		I : PART - A	**10**		
I	a.	Define static and kinematic indeterminacy?	2	L1	CO1
	b.	State conjugate beam method?	2	L1	CO2
	c.	With sketch list the different types of supports in the cable structures?	2	L1	CO1
	d.	State Castiglione's theorem?	2	L1	CO2
	e.	Define statically indeterminate structure?	2	L1	CO1
		II : PART - B	**90**		
		UNIT - I	**18**		
1	a.	Determine the slopes at A and B and maximum deflection in the beam shown in Fig.1(a). Use Macaulay's method. Take E = 200 GPa and I = 70×10^6 mm^4.  Fig Q1.(a)	9	L4	CO2
	b.	Determine the forces in members and tabulate neatly. Use method of joints for the shown Fig.1(b)  Fig. Q1.b	9	L4	CO1

Contd…2

c. Analyze the truss shown in Fig.1(c) by method of joints.

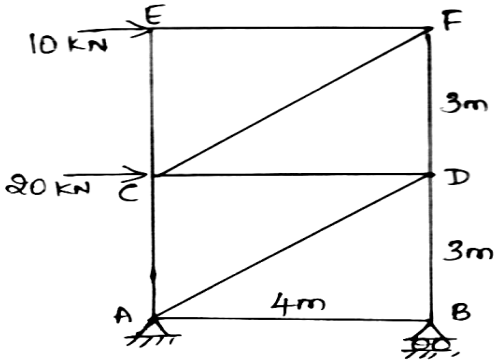


Fig Q1.C

9 L4 CO1

UNIT - II **18**

2 a. Analyse a simple supported beam subjected to a concentrated load P at centre. Find end slopes and deflection at the center. Use moment area method in the analysis. 9 L4 CO2

b. Find the deflection at the free end of the cantilever beam shown in Fig.2(b) by using moment area method. Take EI is constant.

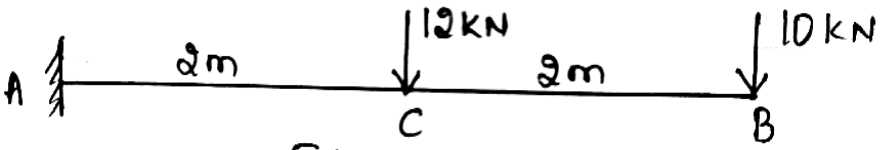


Fig Q2.b

9 L4 CO2

c. Determine the maximum slope and deflection in the beam shown in Fig.2(C). Take EI constant use conjugate beam method

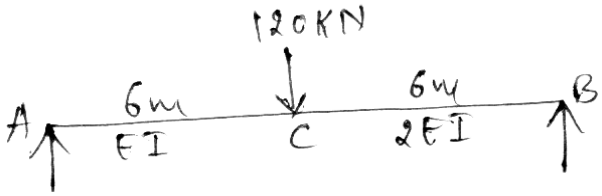


Fig 2(C)

9 L4 CO2

UNIT - III **18**

3 a. A suspension cable having support at the same level has a span of 30 m and maximum dip of 3 m. the cable is loaded with a UDL of 10 KN/m throughout its length. Find from the first principle the maximum tension in the cable. 9 L3 CO1

b. A cable of span 120 m and dip 10 m carries a load of 6 kN/m of horizontal span. Find the maximum tension in the cable and inclination of the cable at the support. Find the forces transmitted to the supporting pier if the cable passes over smooth pulleys on top of the pier. The anchor cable is at 30° to the horizontal. Determine the max bending moment for the pier if the height of the pier is 15 m. 9 L3 CO1

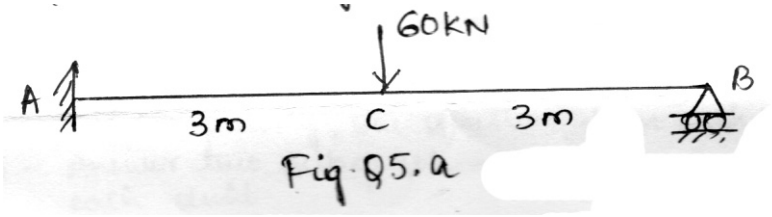
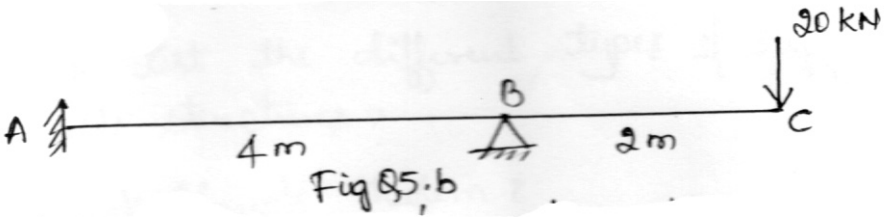
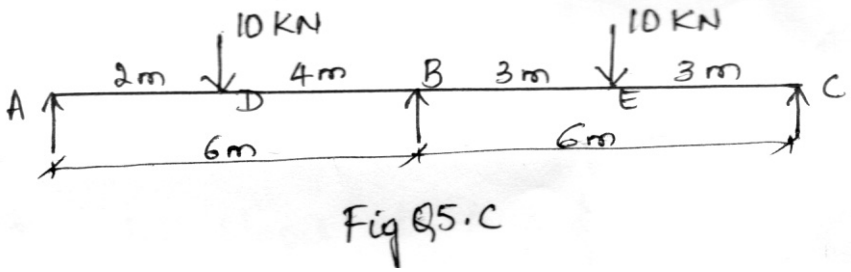
c. A 3-hinged parabolic arch of span 30 m and central rise of 5 m. It is subjected to a concentrated load of 40 kN at 6mfrom left support. Calculated the normal thrust, shear and bending moment at 6m for the left support. 9 L3 CO1

Contd…3

UNIT - IV **18**

4 a.	A SSB has a span of 15 m. A UDL of 40 KN/m and 5m long crosses the girder from left to right .Draw the influence line diagram for shear force and bending moment at a section 6 n from left end . Use these diagram to calculate the max shear force and bending moment at this section	9	L3	CO3
b.	A uniformly distributed load of intensity of 2 KN/m and 5m long crosses a simply supported beam of 20 m span from left to right calculate i) Max SF and Max BM at a section 8 m from the left support ii) Absolute max BM	9	L3	CO3
c.	A SSB of span l carries a concentrated load p at a distance of 'a' and 'b' from two ends. Find the strain energy stored in the beam and the defections under the load by Castiglione's theorem	9	L3	CO3

UNIT - V **18**

5 a.	Draw SFD and BMD for the propped cantilever beam loaded as shown in Fig.5(a) .use consistent deformation method  Fig Q5.a	9	L3	CO4
b.	For the propped cantilever beam shown in Fig.5(b). Find the support reactions at 'B' by consistent deformation method find the reactions and then draw BMD EI is constant.  Fig Q5.b	9	L3	CO4
c.	Analyse the continuous beam by three moment theorem. Draw SFD and BMD for Fig. 5(C).  Fig Q5.C	9	L3	CO4

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