Total number of printed pages: **Programme(D)/4ᵗʰ Semester/DCE 401**
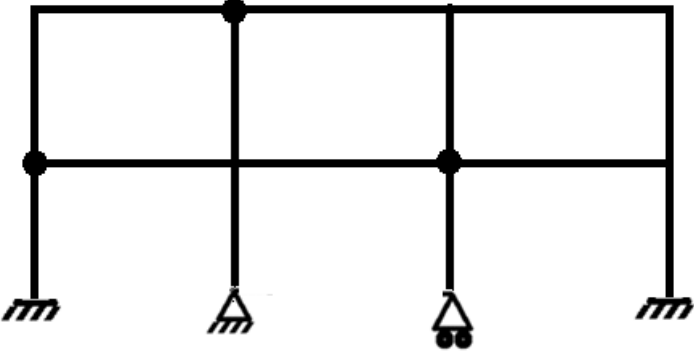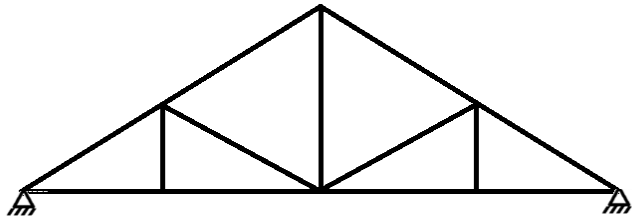
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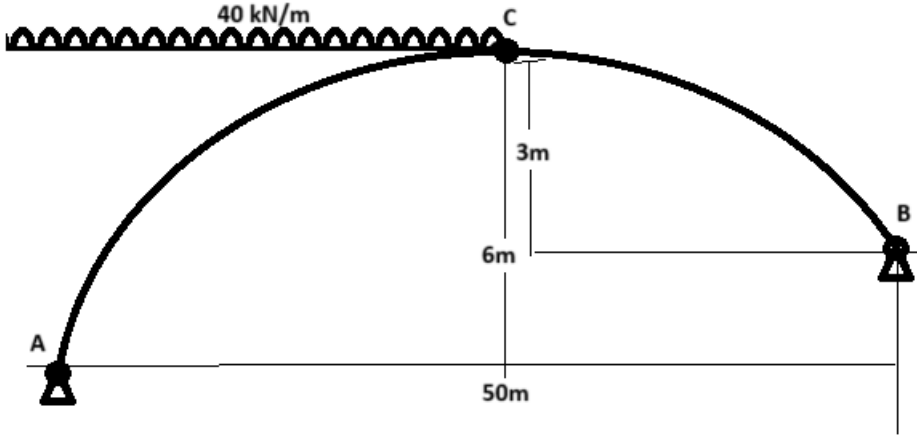**Structural Analysis-I**

Full Marks : 100
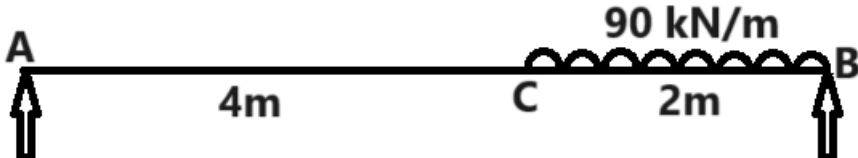
Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **Q1** and **any 4**questions from the rest.*

1.	a)	Check whether the beams are statically determinate or indeterminate, and if indeterminate than find degree of indeterminacy.	3x4=12
	i)	 Fig.1	
	ii)	 Fig.2	
	iii)	 Fig.3	
	b)	Check whether the beams are statically determinate or indeterminate, and if indeterminate than find II, EI and SI.	2x4=8
	i)	 Fig.4	

	ii)	Fig5	

2	a)	Draw a cross section of an arch bridge and show the following,
		
		   i) Abutment
		
		   ii) Springing
		
		   iii) Span
		
		   iv) Rise
		
		   v) crown
			3

	b)	A three hinged circular arch hinged at the springing and at the crown points has a span of 45m and a central rise of 9m. It carries a uniformly distributed load of 30 kN/m over the left half for a distance of 10m from the left support, two concentrated load of 50 kN and 100 kN at a distance of 15m and 30m respectively from the left support. Find i) Reactions at the supports ii) Vertical shear and moment at a point D, 18m from the left support. iii) Normal thrust and radial shear.	17
3		A three hinged parabolic arch having support at different levels shown in fig.6 carries a uniformly distributed load of intensity 40 kN/m over the left portion of the arch. Determine i) Support reactions ii) Moment and shear at point D, at a distance 15m from the left support. iii) Normal thrust and radial shear.	20

|			
		fig 6	

4		A light cable is supported at two points 30m apart which are at the same level. The cable supports two concentrated loads 30 kN and 50 kN at a distance of 8m and 20m from the left support respectively. The deflection at the first point is 0.5m. Determine
		
		    i) Support reactions
		
		    ii) Tensions in the different segments
		
		    iii) Total length of the cable after deflection.
			20

5		A cable of span 130m and dip 10m carries a load of 6 kN/m of horizontal span. The anchor cable is at 30^0 to the horizontal and the height of the pier is 15m. Determine
		
		    i) The support reactions
		
		    ii) Maximum tension on the cable.
		
		    iii) Forces transmitted to the pier if the cables passes over pulley on the top of the pier.
		
		    iv) Forces transmitted to the pier if the cables passes over rollers on the top of the pier.
			20

6	a)	Find the deflection of the simply supported beam given in the fig.7. Use strain energy method. (10) Fig.7	10
	b)	Find rotation and deflection at point B by moment area method for the beam shown in fig.8.	10
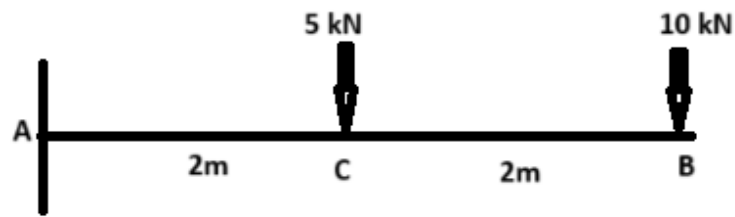
Fig.8

| 7 | | Find slope and deflection at point B in the cantilever beam shown in the fig.9 below by conjugate beam method. | 20 |

Fig.9