S.E. (Civil) (Semester - II) Examination, 2014

STRUCTURAL ANALYSIS - I

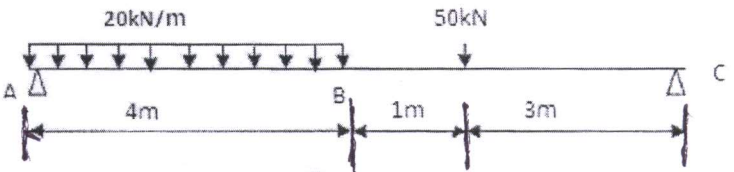
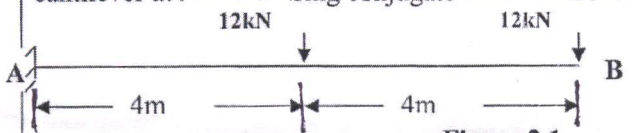
(2008 Course)

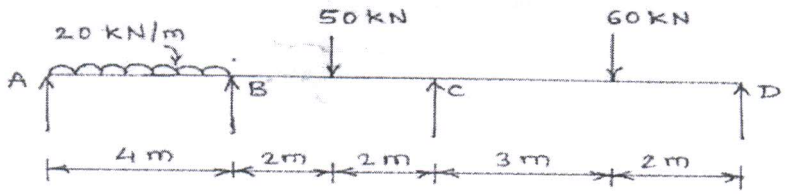
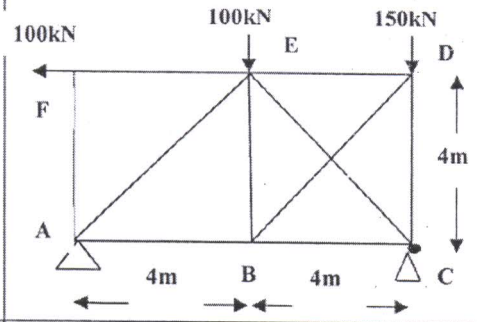
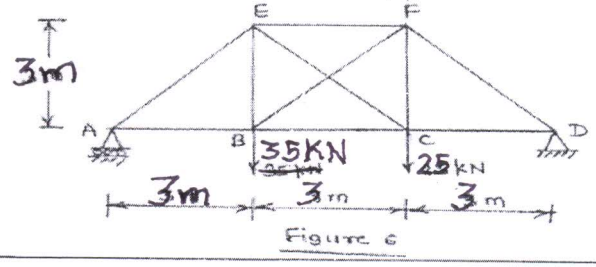
Time: 3 Hours **Max. Marks: 100**

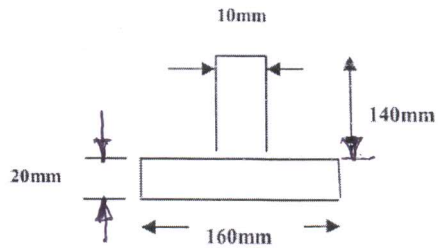
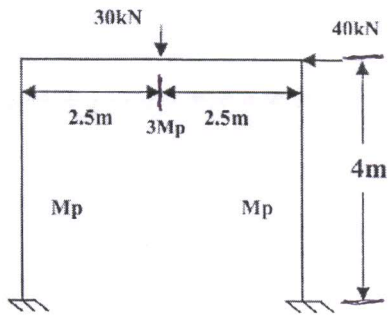
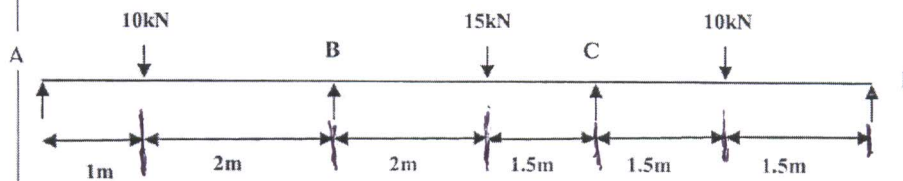
Instructions:

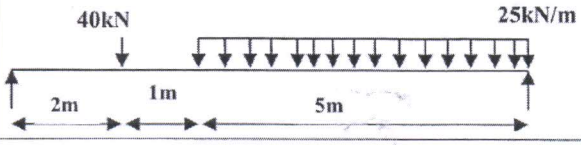
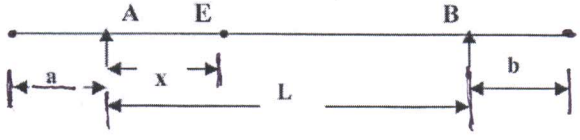
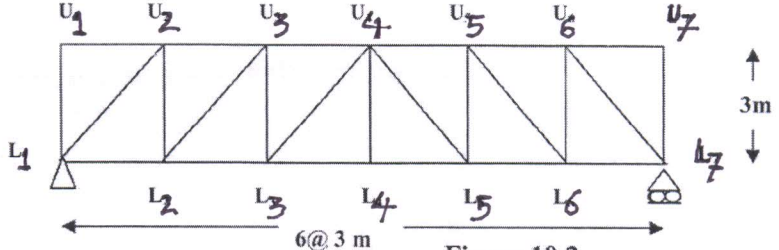
1) *Answer **Q.1** or **Q.2**, **Q.3** or **Q.4**, **Q.5** or **Q.6** from Section - I*
2) *Answer **Q.7** or **Q.8**, **Q.9** or **Q.10**, **Q.11** or **Q.12** from Section - II*
3) *Answer to the **two**Sections should be written in separate Answer books.*
4) *Neat sketches must be drawn wherever necessary.*
5) *Figures to the right indicate full marks.*
6) *Assume suitable data, if **necessary.***
7) *Use of Non- programmable Electronic Scientific calculator is allowed*

SECTION-I

1.	**a)**	Explain relation between actual beam and conjugate beam.	4
	b)	A simply supported beam of span 8 m is loaded and supported as shown in figure1.1. Using Macaulay's method, determine slope and deflection at 'B'. Assume EI = 4×10^4 KN-m^2  **Figure 1.1**	7
	c)	Using Moment area method, Find the slope and deflection at the free end B of a cantilever beamwith uniform cross section, subjected to point load P at the centre of beam.	7
		OR	
2.	**a)**	A simply supported beam of 5 m span is subjected to central point load of 20 kN. Determine the maximum slope and deflection of the beam.	7
	b)	A cantilever beam of span 8 m is carring load of 12 kN at the free end another 12 kN at its centre as shown in figure 2.1. Determine slope and deflection of the cantilever at free end using conjugate beam method. Take EI = constant  **Figure 2.1**	7
	c)	Differentiate between static & kinematic indeterminacy	4

3.	a)	A continuous beam ABCD supported and loaded as shown in figure 3. Find moments and reactions at supports using theorem of three moments. Draw SFD and BMD.  Figure 3	8
	b)	A fixed beam AB of span 7 m is subjected to udl40 kN/m over a 3mstaring from support A. Determine the support moments from the first principle, and draw SFD and BMD.	8
		OR	
4.	a)	State the principle of superposition and explain it with suitable example	4
	b)	State the expression for strain energy under the effect of axial force, shear force, bending moment and torsion.	4
	c)	Analyze proped cantilever beam of span 5 m subjected to udl of 12 kN/m throughout the span and draw SFD and BMD,	8
5.		Find the forces in the member of the truss loaded and supported as shown in figure 5.1  Figure 5.1	17
6.		Find the forces in the members of the truss supported and loaded as shown in Figure 6 Assume that the elastic modulus and area of cross-section for all the members are the same.  Figure 6	17

		SECTION II	
7	a)	Write assumption in plastic theory.	4
	b)	Explain the failure mechanisms of one bay one storey rigid jointed portal frame.	4
	c)	Cross section of beam in following figure is subjected to sagging bending moment. Find shape factor if permissible yield stress in compression and in tension are 190 MPa and 280 MPa respectively.(Figure 7.1)  **Figure7.1**	
		OR	9
8	a)	The frame is supported and loaded with ultimate loads as shown in figure 8.1. Find plastic moment and collapse load.  **Figure8.1**	9
	b)	A continuous beam ABCD is loaded as shown in Figure8.2. Find the collapse load.  **Figure 8.2**	8

9	a)	A simply supported beam loaded as shown in figure 9.1. Find reactions using ILD.  **Figure 9.1**	8
	b)	What is truss? State the assumption made in the analysis of truss.	4
	c)	State the Muller Breslau's principle.	4
		OR	
10	a)	Plot ILD for reactions at A and B supports and S.F.& B.M.D. at point 'E' for the beam shown in figure 10.1  **Figure 10.1**	8
	b)	Construct ILD for forces in members L_3L_4,U_3U_4, U_3L_4,L_3U_3.Use Figure 10.2  **Figure 10.2**	8
11	a)	Two wheel loads 125 kN and 140 kN are spaced 4 m apart and are moving on Girder AB of 15 m span. Any wheel can lead the other. Find i) Maximum positive and negative shear force at 5 m from 'A'. ii) Maximum end shears.	8
	b)	A simply supported beam AB of span 18 m is loaded with udl, 50 kN/m over a span of 5 m moving from left to right. Determine the maximum negative and positive SF and BM at section 7 m from left support.	9
		OR	
12	a)	For the condition of maximum bending moment under chosen wheel load, prove that the chosen wheel load and resultant of all wheel loads should be equidistance from centre of the girder.	8
	b)	Five point loads 70 kN, 70kN, 140kN, 140kN and 80 kN spaced at 2 m , 2.3 m, 2 m and 1.7 m in order to cross a girder of 25m span from left to right with 80 kN load leading. Determine bending moment at 7 m from left hand support. Also determine shear force at same point.	9