Kafrelshiekh University
Faculty of Engineering
Department of Civil Engineering

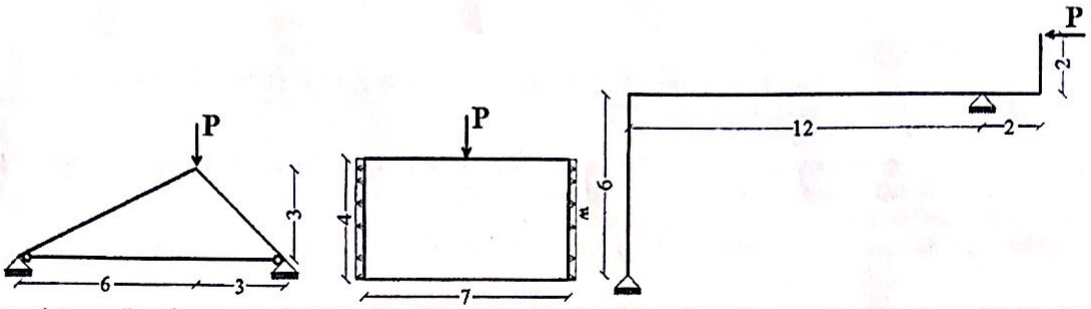
Third Year Students of Civil Engineering	Course title: Design of Reinforced Concrete structures 2		Course code : CES3015
Date : 23-5-2018	Term : Second	Total Assessment Marks : 75	Time Allowed : 4 hours
f_{cu} = 30 MPa, St.360/520, L.L.= 2 kN/m² Flooring cover = 2 kN/m² for all questions	Any missing data should be reasonably assumed. Answer as many questions as you can.		الامتحان مكون من 5 أسئلة فى صفحتين

ILOS (A.4, A.5, A.6, A.9, B.4, B.5, B.11, C3, C4, C6, C7, D1, D2, D6 and D7.

Question (1) (27 marks)

A- Figure (1) shows three different statically systems of frames under the shown loads, it is required to draw the B.M.D. and the corresponding main tension steel.

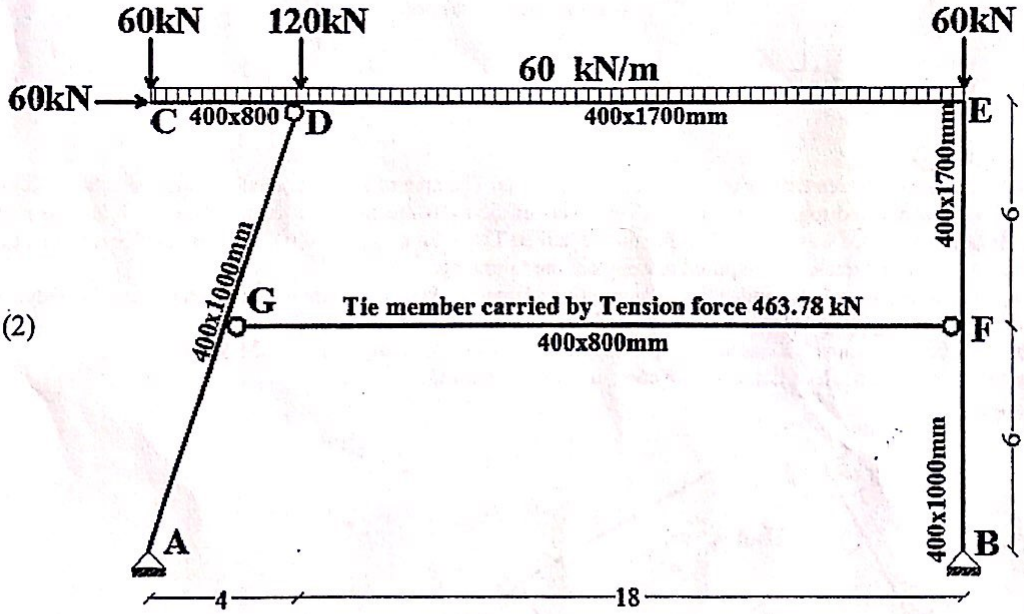
Figure (1)



B- Figure (2) shows an intermediate frame spaced at 6 m. The ultimate loads and concrete dimensions are shown in figure (2). The frame is hinged at A and B and the frame is intermediate hinge at D. The internal force in tie member G F is 463.78 kN. If the slab thickness is 120 mm, it is required to carry out the following:

1) Draw BMD, NFD and SFD for the frame.
2) Design the critical sections for both flexure and shear.
3) Design the two hinged supports A and B.
4) Draw the reinforcement details of the frame in elevation and cross sections with suitable scale.

Figure (2)



Question (2) : (15 marks)

A- Answer the following points with net sketches:

1) Compare between load transfer mechanism for arch girder and arch slab.
2) State maximum span of arch slab and arch girder.
3) Illustrate design steps of the column and footing in two cases; the first is arch slab with a tie, and the second is arch slab without a tie.
4) Draw the connection between the column and the arch slab in addition to the connection between the column and the arch girder showing reinforcing bar of the connected elements.

B- An arched parabolic slab without tie of span 16m and its rise is 2.8 m supported on a two cantilever frames. The frame spaced at 5 mm and the clear height is 6 m in addition to the cantilever length is 3m. If the ultimate average total loads are 6 kN/m² acting on the horizontal projection; it is required to carry out the following:

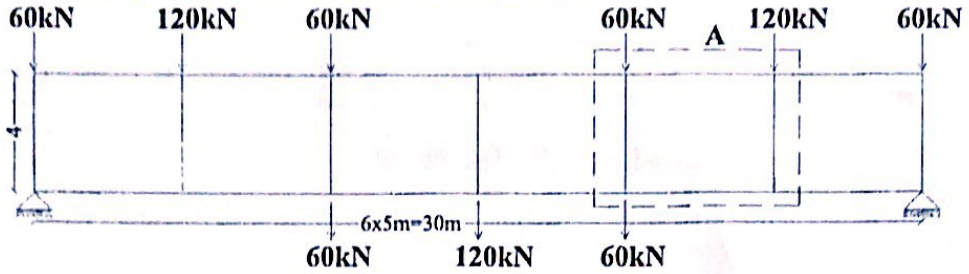
1) Draw a sectional elevation to reasonable scale showing the concrete dimensions of all elements until the foundation level.
2) Design the arched slab and its components (design and drawing with net sketch).
3) Draw with net sketch without any calculation the expected BMD for the frame and main tension steel showing eccentric RC footing.

Question (3): (8 marks)

Figure (3) shows a veriendeel girder of span 30 m. The ultimate loads are illustrated in Figure (3). It is required to carry out the following:

1) Draw BMD, NFD and SFD for the veriendeel girder.
2) Draw with net sketch without any calculation the main tension steel for part A only.

Figure (3)

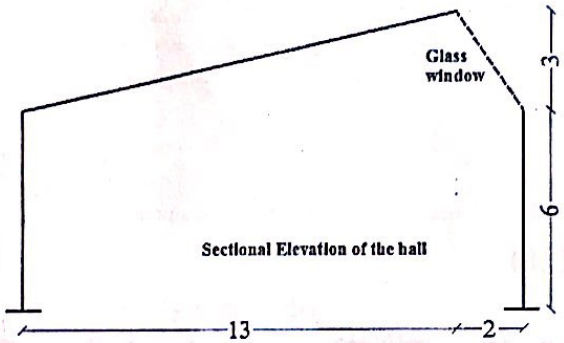


Question (4) : (15 marks)

Figure (4) shows elevation of an industrial hall (15x50m). The column allowed only in the outer perimeter of the hall. A north light roof structure is required. It is requires carrying out the following:

1) Suggest the suitable system for the hall.
2) Draw to suitable scale complete plan, sectional elevation and side view showing all concrete dimensions until foundation level. If a future extension of the hall is expected, draw to suitable scale the end gable details.
3) Design the roof slabs and all elements except RC footings.
4) Draw to suitable scale the reinforcement details of all elements in sectional elevation and cross sections.

Figure (4)

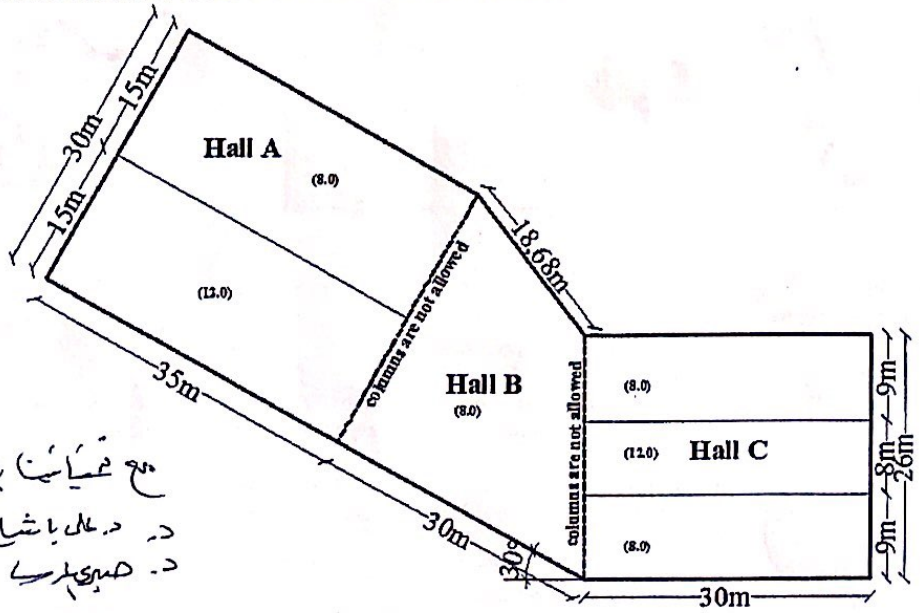


Question (5) : (20 marks)

Figure (4) shows a plan of workshop area that consisted of three main halls. The area of hall A is 30x35m and the area of hall C is 26x30m. The two halls A and C were connected together by hall B. The levels of the roofs are shown in figure. The sky light was required in both halls A and C while the horizontal roof was required in the middle hall B. The columns allowed only in the outer perimeter of the halls. The columns are prevented on the dashed lines. It is required to carry out the following:

1) For the three halls, suggest the more economical main supporting elements (**MSE**) and draw to scale the sectional elevations and plan showing concrete dimensions for all elements.
2) For the hall C only, calculate the ultimate loads acting on the MSE then design all components of the **MSE**.
3) Draw reinforcement details of the MSE of hall C in elevation and cross sections.

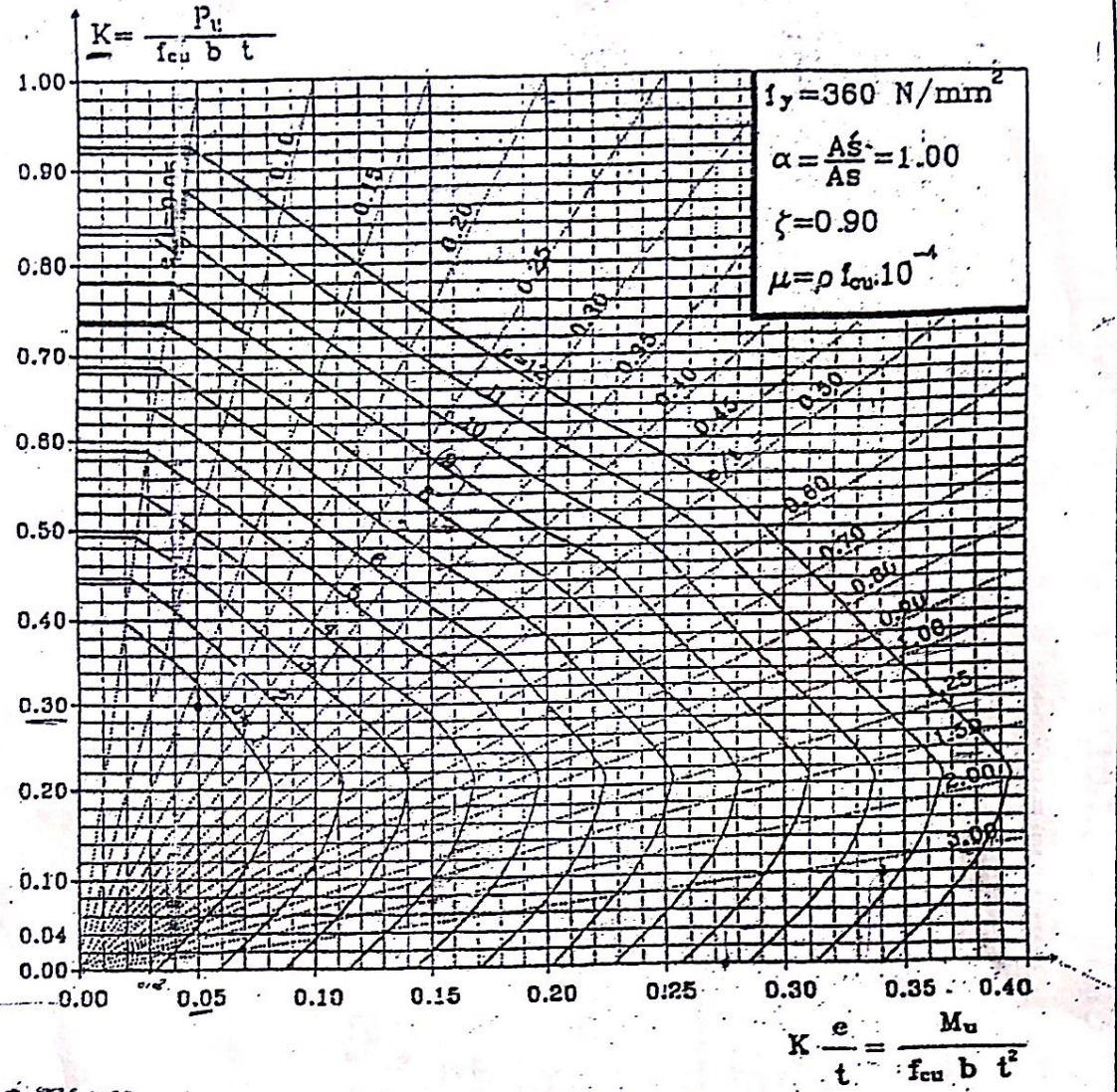
Figure (5)

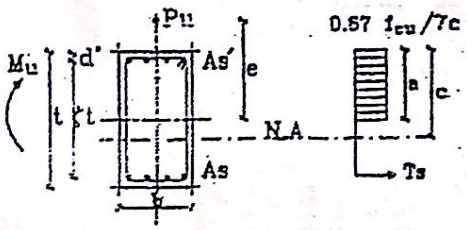


مع تمنياتنا بالتوفيق
د. علي باشا عاشت
د. صبري

Chart (4-4) : INTERACTION DIAGRAMS

FOR DESIGN OF SECTIONS SUBJECTED TO ECCENTRIC COMP. FORCES



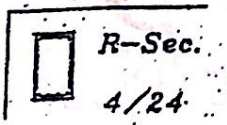


$\mu = \rho\, f_{cu}.10^{-4}$

$A_s = \mu\, b\, t$

$A_s' = \alpha\, A_s$

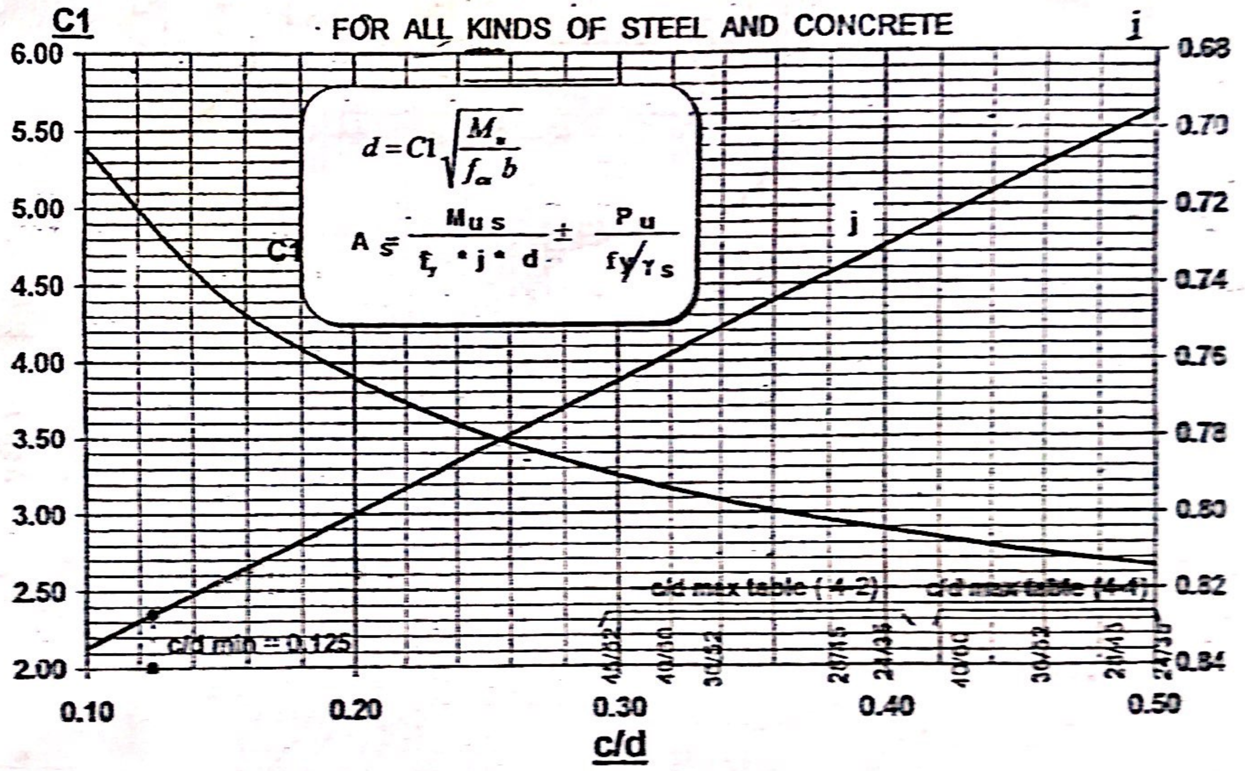
$\zeta = \frac{d - d'}{t}$



CHART(2-3):ULTIMATE LIMIT DESIGN CHARTS

FOR SIMPLE BENDING & ECCENTRIC FORCE (TENSION FAILURE)

FOR ALL KINDS OF STEEL AND CONCRETE



c/d	C1	J
0.1250	4.85	0.826
0.1375	4.64	0.821
0.1500	4.46	0.817
0.1625	4.29	0.813
0.1750	4.15	0.808
0.1875	4.02	0.804
0.2000	3.90	0.800
0.2125	3.79	0.795
0.2250	3.70	0.791
0.2375	3.61	0.786
0.2500	3.53	0.782
0.2625	3.45	0.778
0.2750	3.38	0.773
0.2875	3.32	0.769
0.3000	3.26	0.765
0.3125	3.20	0.760
0.3250	3.15	0.756
0.3375	3.10	0.752
0.3500	3.05	0.747
0.3625	3.00	0.743
0.3750	2.96	0.739
0.3875	2.92	0.734
0.4000	2.89	0.730
0.4125	2.85	0.726
0.4250	2.82	0.721
0.4375	2.78	0.717
0.4500	2.75	0.713
0.4625	2.72	0.708
0.4750	2.70	0.704
0.4875	2.67	0.700
0.5000	2.55	0.695