Kafrelsheikh University Faculty of Engineering		
Final Examination of Academic Year 2020 / 2021		
Department: Civil Engineering	Year: Third	Total Marks: 75
Course Title: Design of Steel Structures	Course Code: CES3016	Term: Second
Date: 17 / 6 / 2021	ILOs: a_1, a_5, a_{11}, b_1, b_2, b_{10}, c_2, c_6, d_1, d_5, and d_6	Allowed Time: 4 hrs

Answer as much as you can

Question No. 1: **(30 Marks)**

A. The industrial hall shown in Fig. 1 will be covered using plane frames. It is required to draw with a suitable scale plan, elevation and side view showing the different arrangement of bracing systems. Intermediate columns are not allowed inside the hall. **(5 Marks)**

B. The floor system shown in Fig. 2 consists of a reinforced concrete slab rested on steel I-beams. Slab thickness = 0.1 m, L.L. = 400 kg/m^2, F.C. = 140 kg/m^2, and steel of grade 37. It is required to: **(15 Marks)**

1. Design a typical secondary beam B1 as continuous beam
2. Design a typical main beam B2

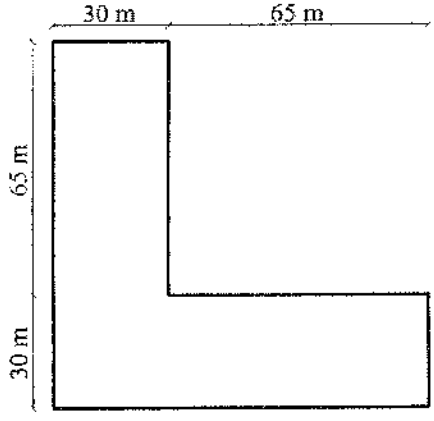

Fig. 1

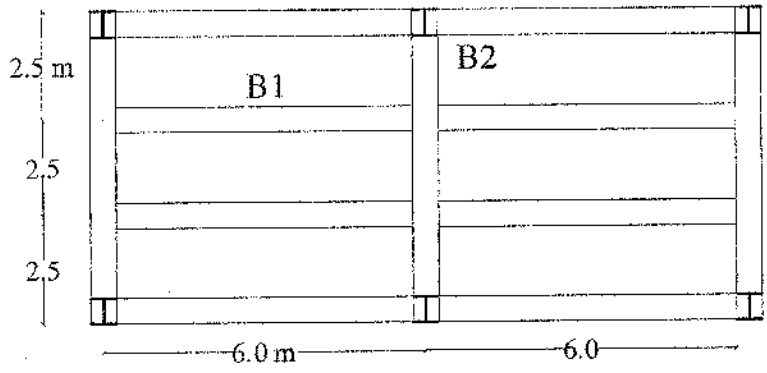

Fig. 2

C. Design a crane track girder with 5.5 m span using broad flange I-beam (HEA) section. Weight of trolly is 1.20 t while the weight of the crane bridge is 4.50 t. Moreover, the maximum weight to be displaced is 20 t. Distance between wheels of crane bridge is 2.0 m. span of crane bridge is 17.5 m. The safe length is 0.8 m from C.L of the crane track girder. Consider the dynamic coefficient I=25% and the lateral shock=10%. St. 52. **(10 Marks)**

Question No. 2: **(15 Marks)**

A. Discuss with neat sketches the buckling length factors for well-defined end supports, columns in frames with truss girder, and columns in rigid frames. **(10 Marks)**

B. Calculate the buckling lengths for roof and combined columns shown in Fig. 3. Also determine the buckling lengths for columns I and II shown in Fig. 4 assuming vertical bracing outside plane connecting columns at floor levels only. **(5 Marks)**

Question No. 3: **(45 Marks)**

For the frame shown in Fig. 5, using ST. 44, it is required to:

1. Design the rafter as rolled section. **(10 Marks)**
2. Design the column AB as open column using S.I.B section. **(10 Marks)**
3. Design the rigid connection between the rafter and the column. **(10 Marks)**

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4. Design the hinged base A. **(10 Marks)**
5. State **without calculations** the design procedures for fixed base with sketches. **(5 Marks)**

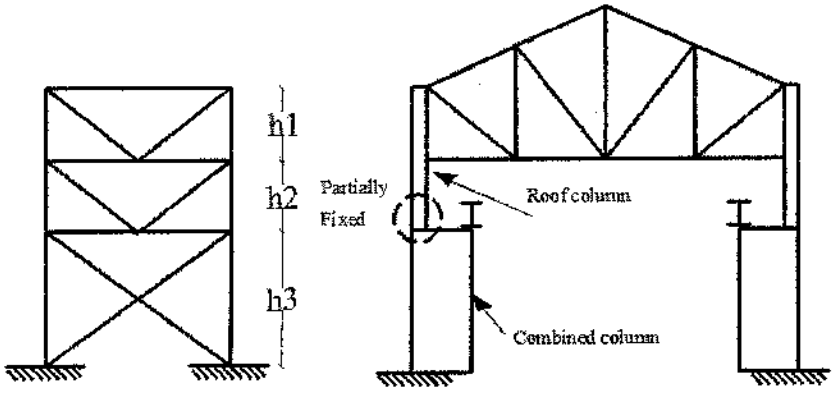

Fig. 3

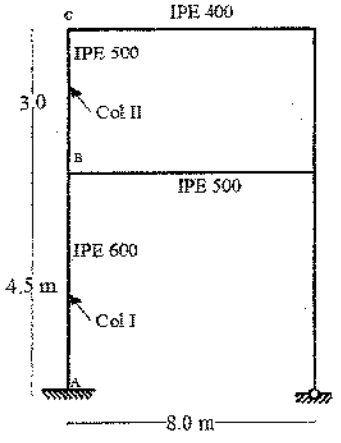

Fig. 4

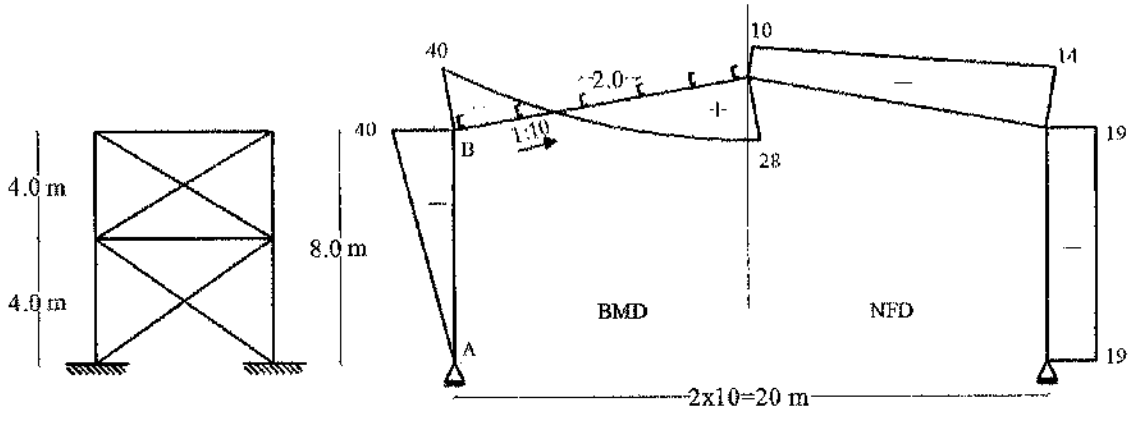

Fig. 5

Question No. 4: **(10 Marks)**

Find the maximum span which can be carried by the composite beams shown in Fig. 6 using rigid connectors assuming that the temporary supports are used. Moreover, design the stud shear connectors. The live load is 500 kg/m^2, the floor cover is 200 kg/m^2 and f_{cu}=250 kg/cm^2 using steel 44.

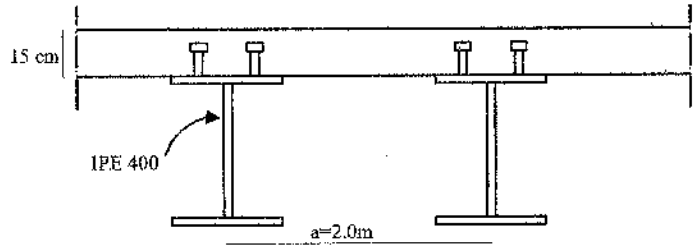

Fig. 6

Good Luck

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