Question (1) (40 marks)

1) Write short notes with sketches about :-
   a- Decrease the effect of My in roof purlins.
   b- Welding Process
   c- Modes of failure of bolted connections.

2) Find the maximum compression and tension forces that can be carried by \( 2 \times 100 \times 100 \times 10 \) if \( L_{bh} = 2.0 \text{ m} \) and \( L_{by} = 4.0 \text{ m} \), using bolts M16 grade 5.6.

3) Find the maximum capacity \( (P) \) for the bolted connection shown in Fig. (1) using bolts M16 grade 5.6?

4) For the roof truss shown in Fig. (2), calculate the buckling lengths for members \( A, B, C, D \) and \( E \).

\[ \text{Fig. (1)} \]

\[ \text{Fig. (2)} \]

5) A steel structure is to be designed to cover the area \( (23.0 \text{ ms} \times 60.00 \text{ ms}) \) as shown in Fig. (3). The area ABCD is opened while area CDEF is closed. The columns may be arranged only on the lines CDEF. The clear height of the total area is 8.0 ms. Draw to a suitable scale a general layout showing the different elements of the structure and bracing systems (plan, elevations, side views and end gable)?

6) Design the bolted connection shown in fig. (4) by using bolts M16 grade 4.6, case A, if the connection with a continuous joint? draw its details to scale 1:10?

\[ \text{Fig. (3)} \]

\[ \text{Fig. (4)} \]

Question (2) (30 marks)

1) Fig. (5) shown the welded connection between B.F.I. No. (340) and gusset plate \( t=12 \text{ mm} \) subjected to compression force, given the lengths of weld. Find the maximum compression force can be carried by the connection?

2) For the connection shown in fig. (6), Check the given number of bolts, if Reaction of secondary beam = 18.0 ton? \{ bolts M20 grade 5.8\}

3) Check the number of bolts which connecting the bracket to the column as shown in fig. (7), using M20 grade 4.6 if the load \( P=20.0 \text{ t} \) is carried by plate 1.2 cm thickness, and the column is B.F.I No. (300).?