Form A : Paper-setting Blank

Ref. No. ...*EX/CE/5/T/403/2018(Old)*

.....*B. Civil Engineering (Part Time) 4th Year*... EXAMINATION, *2018(Old)*
(1st / ~~2nd~~ Semester / ~~Repeat / Supplementary / Annual / Bi-Annual~~)

SUBJECT .....*Design of Metal Structures -I*
( Name in full )

PAPER .....*XX*.....

Full Marks 100
(50 marks for part I)

Time: ~~Two hours~~/Three hours/~~Four hours/Six hours~~

Use a separate Answer-Script for each part

| No. of Questions | PART I | Marks |
|---|---|---|
| | **Assume reasonable data if not given, IS 800, IS875, Section Hand Book are allowed in the examination hall** | |
| | **Answer any two questions** | |
| 1) | Calculate nodal wind forces on the truss shown in Fig. 1 and the wind pressure on the walls as per IS:875, part-III of the factory shed with the following dimensions:<br>i) Location----Delhi<br>ii) Span of truss ---20m<br>iii) Spacing of truss----3.5m<br>iv) Number of truss----8<br>v) Height of eves from GL---10m | 25 |
| 2.a) | A tie member of truss consisting an angle section ISA 60×60×6 of Fe410 grade is welded to 8mm gusset plate. Design a weld to transmit a factored load of 160kN. Assume shop weld. | 10 |
| b) | Design a bolted torsion-shear bracketed connection to carry a factored vertical load of 250kN. The load is acting at a distance 350mm from the centre of the column. The cross section of the column is ISMB450@72.4kg/m. | 15 |
| 3) | The forces in the member **PQ** of the truss as shown in Fig. 1 are as follows:<br>Design the member using double angles and calculate the number of bolts. Assume that the longitudinal members are placed at alternative nodes. Use Limit State Method of design. | 25 |

| Member PQ | DL | LL | WL |
|---|---|---|---|
| | 115 kN (T) | 90 kN (T) | 245 kN (C) |

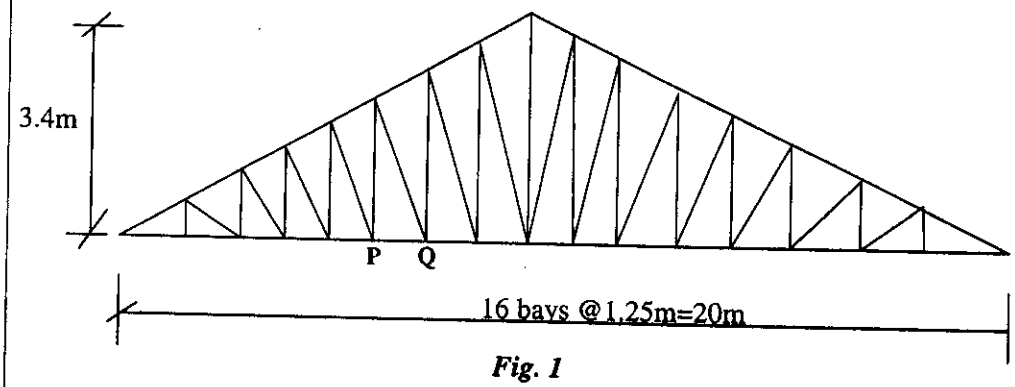


*Fig. 1*

Ref. No. *Ex/CE/5/T/403/2018(OLD)*

.....*B.C.E.[Evening] 4th Year 1st Semester [OLD]*..... EXAMINATION, *2018*

SUBJECT ..... ***Design of Metal Structures - I***.....

PAPER .....

ime: **Three hours**

**Full Marks 100**
**(50 marks for each part)**

**Use a separate Answer-Script for each part**

| o. of uestions | **PART II** | Marks |
|---|---|---|
| | [Use of I.S. 800 and SP-6(1) are allowed in the examination hall.]<br>(Consider Fe410 steel i.e. 'yield stress' of steel = 250MPa)<br><br>**Answer any TWO questions** | |
| 1. | A steel floor beam is simply supported over a span of **5.0m**. It is subjected to uniformly distributed load of intensity **40kN/m** [15kN/m (D.L.) and 25kN/m (L.L.)] acting over its entire length. Design a rolled steel I-section **(ISMB section)** for this beam if the compression flange of the beam is **laterally unrestrained / laterally unsupported** along its length. Consider stiff bearing length as 150mm. Show all checks. Assume any reasonable data, if required. | 25 |
| 2. | Design a rolled steel channel section (**ISMC section**), under '**dead load and wind load (suction)**' combination, for a purlin member in an industrial shed having the following data:<br>a) Angle of truss = $20.0^0$; b) Spacing of truss = 4.0 m c/c; c) Span of truss = 15.0 m;<br>d) Spacing of purlins = 1.4 m c/c; e) Net intensity of wind pressure = 1.6 $kN/m^2$;<br>f) Weight of galvanized sheet = 150 $N/m^2$, g) Intensity of live load = 0.7 $kN/m^2$.<br>Also check whether the section is safe under '**dead load and wind load (thrust)**' combination. Assume any reasonable data, if required. | 25 |
| 3. | A column made of **ISMB 600 @122.6kg/m** is hinged at both the ends. Its effective length is **5.0m**. It is subjected to factored axial compressive load of **1000kN** and a factored moment of **150kNm** about its major axis at both the ends. Check whether the column section is safe or not. | 25 |
| 4. | a) An **ISMB 500 @ 86.9 kg/m** has been used as a column of effective length **3.5m**. Calculate the load carrying capacity ($P_d$) of the column.<br>b) Design a suitable '**bolted / welded gusseted base plate**' for the above mentioned column if it subjected to maximum axial load as calculated above. The base plate is to rest on a concrete pedestal having the safe bearing capacity of 9.0MPa. Assume any reasonable data, if required. Draw a neat sketch to show the details of the column with base-plate. Use 24mm diameter bolts of grade 4.6 having $A_{nb}$ = 353$mm^2$ for bolted connection and 'shop weld' for welded connection. | 25 |
| | = = = E N D = = = | |