# BIRLA INSTITUTE OF TECHNOLOGY \& SCIENCE, PILANI <br> First Semester (2022-23) <br> COMPREHENSIVE EXAMINATION <br> (OPEN BOOK) 

Course No. CE G618
Date: 22/12/2022
Course Title: Design of Multi-storeyed Structures
Max Marks: 90
Duration: 120 minutes
Q. 1 Compute the rigidities of the bents in both the principal directions of the plan shown in Fig.Q1.

Stiffness of interior columns $=9.0$
Stiffness of exterior columns $=4.5$
Stiffness of beams $=18$


Fig.Q(1)
Also compute the center of rigidity with respect to lower left corner of the plan.
Q. 2 Fig.Q2 gives floor plan of a shear walled multistoried structure consisting of three shear walls (A, B, C \& D) made of M30 grade of concrete. The horizontal shear in the storey under consideration is denoted by $\mathrm{P}_{\mathrm{y}}$ acting on its long side along the center line of the building. The storey height is taken as 3 m . It is required to compute the shear center of the structure. Wall thickness is 230 mm everywhere.

Q. 3 A 10 storeyed building has 6 bays at 4.5 m spacing as shown in Fig. Q4(a). Calculate the drift at the top under a wind pressure of $1.5 \mathrm{kN} / \mathrm{m}^{2} . \mathrm{M} 40$ grade of concrete has been used in construction.
[12]
Size of Beams $=230 \mathrm{~mm} \times 400 \mathrm{~mm}$
Size of Columns $=230 \mathrm{~mm} \times 700 \mathrm{~mm}$


Beam X-section
Q. 4 (b) gives the line plan of the above building. However direction of wind has been changed now and it is shown in the figure. Now you have four shear walls ( 150 mm thick and 7 meter long). You are required to locate these shear walls with proper orientation on the plan.

Q. 4 For the tower Shown in Fig.Q4
i) Compute the support reactions at Support M \& N
ii) Find the forces in the members $\mathrm{HJ}, \mathrm{HI} \& \mathrm{GI}$ as indicated in the Fig.Q4


Fig.Q4

