

School: SOE	Level: BE	Invigilator's Sign:
Program: BCE	Year/Part: IV/I	Superintendent's Sign:
Subject: Vulnerability Assessment and retrofitting (EG712CE)		Code No.

- i. Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.
ii. The main answer sheet can be used for rough work.

Code No.

GROUP A (Multiple-Choice Questions)	[10x1=10]	Time: 20 Minutes
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- To quantitatively estimate seismic risk, the fundamental relationship is often expressed as:**
 - Risk = Hazard + Vulnerability + Exposure
 - Risk = Hazard × Vulnerability × Exposure
 - Risk = Hazard / (Vulnerability + Exposure)
 - Risk = Exposure - (Hazard × Vulnerability)
- A major seismic vulnerability for lifelines in a mountainous country like Nepal is:**
 - Corrosion from salty sea air.
 - Liquefaction of extensive coastal plains.
 - Landslides and ground failures triggered by shaking that damage roads and pipelines.**
 - High winds that can topple transmission towers
- A post-earthquake damage assessment is crucial for:**
 - Increasing the property tax value of buildings.
 - Long-term urban planning for new cities.
 - Immediately determining the safety of buildings for occupancy (e.g., tagging as Inspected, Unsafe, or Restricted Use) and guiding emergency response.**
 - Conducting detailed architectural reviews.
- The Rapid Visual Screening Procedure (RVSP) is best described as a:**
 - Detailed and quantitative analysis method requiring specialized equipment.
 - Quick, first-level survey to identify buildings that are potentially seismically hazardous and require more detailed evaluation.**
 - Method used to determine the final retrofitting design for a structure.
 - Process for issuing building occupancy permits.
- According to most codes, the "Immediate Occupancy" performance level implies that after an earthquake:**
 - The building is safe to occupy and only has minor cosmetic damage.**
 - The building may have significant damage but will not collapse.
 - The building must be demolished immediately.
 - Only emergency repairs are allowed.
- The primary purpose of the Response Reduction Factor (R) in seismic design codes is to:**
 - Increase the design force to make the building stronger.
 - Account for the ductility and overstrength of the structure, thereby reducing the elastic design force.**
 - Calculate the weight of the building.
 - Determine the number of floors allowed
- Which of the following is an example of a "local deficiency" in a masonry wall?**
 - The building is torsionally unbalanced.
 - The soil beneath the foundation is weak
 - The entire building is too flexible.
 - The wall is inadequately connected to the floor diaphragm.**
- Jacketing of RC columns (with concrete, steel, or FRP) is a local retrofitting method that aims to improve:**
 - The electrical wiring of the building.
 - The column's shear strength, axial load capacity, and ductility.**
 - The aesthetic appearance of the column.
 - The fire resistance without improving structural capacity
- Adding a new reinforced concrete shear wall to a building is an example of a:**
 - Global retrofitting method, as it alters the overall lateral load-resisting system.**
 - Local retrofitting method.
 - Restoration technique.
 - Non-structural repair.
- The use of wireless sensors to monitor dangerous areas after an earthquake is advantageous because they:**
 - Are very cheap and require no technical knowledge to install.
 - Can permanently repair the damage they monitor.
 - Can provide real-time data on movements or strains without requiring personnel to enter unsafe zones.**
 - Are only used for long-term monitoring of historical monuments.

Multiple Choice Questions' Answer Sheet

Marks Secured: _____

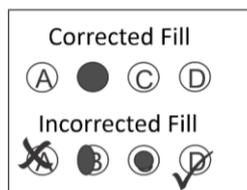
In Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

In Words: _____

Scrutinizer's Sign: _____ Date: _____



1. (A) (B) (C) (D)	6. (A) (B) (C) (D)
2. (A) (B) (C) (D)	7. (A) (B) (C) (D)
3. (A) (B) (C) (D)	8. (A) (B) (C) (D)
4. (A) (B) (C) (D)	9. (A) (B) (C) (D)
5. (A) (B) (C) (D)	10. (A) (B) (C) (D)

Manmohan Technical University
Office of the Controller of Examinations
Exam Year: 2082, Mangsir(Model Question)

School: SOE	Level: BE	Time: 3 Hours
Program: BCE	Year/Part: IV/I	Full Marks: 50
Subject: Vulnerability Assessment and retrofitting (EG712CE)		Code No.
		Code No.

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

Group B (Long Answer Questions -Attempt Any Eight questions) [8*2 = 16]

11. Define the terms Seismic Hazard, Vulnerability, Exposure, and Risk. Illustrate with a diagram or a real-world example how these four components are interlinked.
12. Differentiate between pre-earthquake and post-earthquake damage assessment of buildings.
13. Classify the different types of tests used to determine the in-situ properties of concrete and masonry in existing buildings. Provide examples and brief descriptions of any of the tests.
14. Compare and contrast the key performance objectives of "Life Safety" and "Collapse Prevention.
15. Discuss the concept of redundancy in seismic force-resisting systems as per codes NBC 105 2020.
16. Differentiate between the concepts of "repair," "restoration," "strengthening," and "retrofitting."
17. Compare and contrast the "Local" and "Global" methods of seismic retrofitting. With the help of neat sketches.
18. Explain the critical purpose and objectives of shoring and stabilization for a structurally damaged building, particularly after an event like an earthquake.
19. Why is it important to evaluate axial stress in columns and walls during seismic assessment?

GROUP C (Long Answer Questions - Attempt All Questions)

1. Compare and contrast the Qualitative Evaluation Procedure and the Quantitative Evaluation Procedure for seismic assessment. Discuss the scenarios where each method is most appropriately applied. [4]
- OR
- Explain the concept, purpose, and methodology of the Rapid Visual Screening Procedure (RVSP). What are its primary advantages and limitations as an assessment tool? [4]
2. What is shoring? Detail the different types of shoring systems used for stabilizing different types of structural failures in a damaged building. [4]
 3. Carry out the quick check for the vulnerability assessment of the RCC building for the frame structure with beam size 0.300 m X 0.35 m and column size 0.35 x 0.35 m as shown in the figure 1. The Dead load plus factor of live load is applied in each floor level is given in fig. The building is a residential building that lies in the Biratnagar. Assume $F_{ck}=20$ Mpa, $F_y=500$ Mpa. [6]

Multiple Choice Questions' Answer Sheet

Marks Secured: _____

in Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

in Words: _____

Scrutinizer's Sign: _____ Date: _____

Corrected Fill

(A) ● (C) (D)

Incorrected Fill

~~(A)~~ ● (C) (D) ✓

1. (A) (B) (C) (D)	6. (A) (B) (C) (D)
2. (A) (B) (C) (D)	7. (A) (B) (C) (D)
3. (A) (B) (C) (D)	8. (A) (B) (C) (D)
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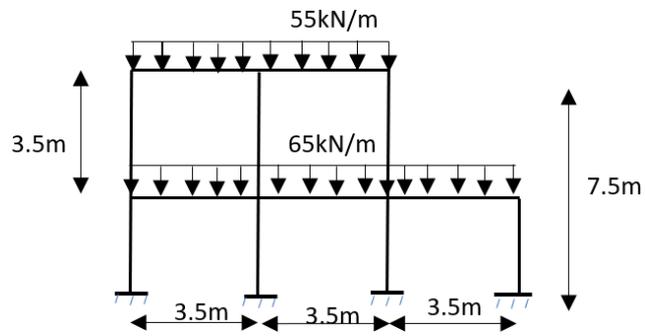


Figure 1

4. The column of height 1500mm and the cross-sectional area of 250X400 mm is applied with axial load of 1628.68kN and Moment 75.33KN-m. Strengthen the column using jacketing method as per IS:15988-2013 assuming following properties: Grade of Concrete =20 N/mm², Grade of steel=500N/mm², Reinforcement provided=8-16mm \varnothing bars and Effective Cover=40mm. [6
5. A four storey building having moment resistant frame with infill walls is located in Dharan, Nepal and has the following data.

Floor	Seismic Weight(kN)	Storey Height,m
Roof	5500	3.25
3 rd	7250	3.25
2 nd	7800	3.25
1 st	6500	3.25

It's plan dimensions are 15 X 20 m. Determine the base shear and lateral forces acting at each floor using NBC 105:2020. [4]

*** ALL The Best ***