



THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING – 2nd YEAR DEGREE

SECOND SEMESTER EXAMINATIONS - 2022

CE 222 – STRUCTURAL ANALYSIS

DATE: FRIDAY, 28TH OCTOBER 2022 – 08:20 A.M

VENUE: STRUCTURES LECTURE THEATRE (SLT)

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. You have 10 minutes to read the paper before the examination starts. You must **not** begin writing during this time.
2. **There are FIVE (5) Questions in this paper. Answer any 4 Questions.**
3. Use only ink. Do not use pencils for writing except for drawings and sketches.
4. Only Calculator is allowed in the examination room. MOBILE PHONE is not allowed (**Switch your Mobile Phones OFF**). Notes and textbooks are not allowed.
5. Start each question on a new page and show all your calculations in the answer book provided. No other material will be accepted.
6. **Write your NAME and Student NUMBER clearly on the front page.**
Do it now.
7. **Marking Scheme:** All Questions carry equal marks.

QUESTION 1

[10 marks]

SLO 1

Analyze the cantilever beam of span l loaded with a concentrated load P at the free end as shown in Fig 1 by conjugate beam method and strain energy method and determine the deflection at free end B. 5+5

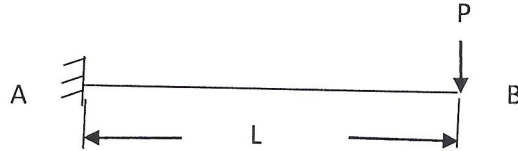


Fig. 1

QUESTION 2

[10 marks]

SLO2

Analyze the two span continuous beam shown in Fig.2 by slope deflection method. Determine M_{AB} and M_{BC} only.

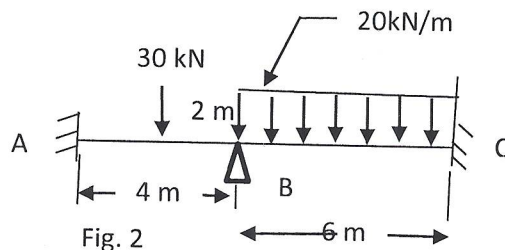


Fig. 2

QUESTION 3

[10 marks]

SLO3

Analyze the rigid frame with two hinged supports shown in Fig. 3 using force method of analysis. The vertical and horizontal members of the frame are made of same material with Young's modulus E . The second moment of area of column and beam are I and $2I$ respectively. Determine horizontal reaction at D.

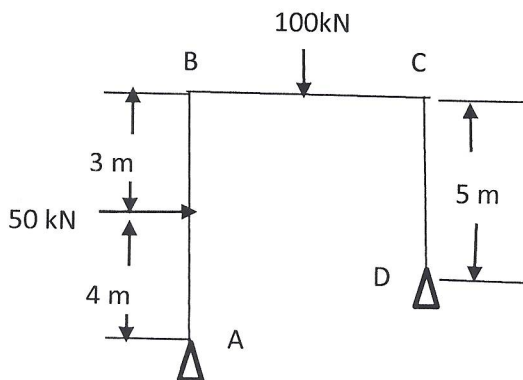


Fig. 3

QUESTION 4 [10 marks] SLO 4 & 5

- a) In your opinion, which are the primary steps in analyzing a structural components with STAAD Pro software? Write the main steps followed under each primary step. 5
- b) What do you understand by the term “boundary conditions” in computerized structural analysis? 2
- c) “Finite Element method of analysis is not used in STAAD, Abaqus and SAP.” State whether the statement is true or false? 1
- d) Why “-1” is used in defining self-weight in STAAD analysis? 1
- Name the step in structural analysis with STAAD Pro in which SF and BM diagrams are drawn. 1

QUESTION 5 [(1+1) x 5=10 marks]

Choose and write whether true or false between the options for each question and justify your choice within two lines.

- a. In the indeterminate structural analysis, force method is also termed as method of consistent deformation.
i. True ii. False
- b. In conjugate beam method, fixed support of real beam is converted into free end.
i. True ii. False
- c. In structural Analysis, slope deflection method is regarded as a deflection method and compatibility method is considered as a force method.
i. True ii. False
- d. In energy method of structural analysis, partial derivative of strain energy with respect to force results in deflection.
i True ii. False
- e. External indeterminacy of a structural member is defined as the difference between the number of unknown reactive components and the number of equilibrium equations of statics available for the solution.
i True ii. False