

KADI SARVA VISHWAVIDYALAYA

B.E. SEMESTER-III EXAMINATION DECEMBER-2016

Subject Code: CV305

Subject Name: Structural Analysis I

Date: 28/12/2016, Wednesday TIME: 10:30 A.M. To 1:30 P.M.

Total marks: 70

Instruction:

1. Answer each section in separate Answer Sheet.
2. Use of scientific calculator is permitted.
3. All questions are compulsory.
4. Indicate clearly the options you attempted along with its respective question number
5. Use the last page of supplementary for rough work

Section-1

- Q.1 (A) Identify the members from the figure 1 subjected to bending and torsion and calculate [05] amount of bending and torsion in respective elements.
(B) Draw shear force and bending moment diagram for the figure 2. [05]
(C) Give the formula to calculate slope and deflection at free end of cantilever beam of [05] span "L" and subjected to point load "P" at free end.

OR

- (C) Draw degrees of freedom for figure 3. [05]
Q.2 (A) Draw free body diagrams for the frames as shown in figures 4.a and 4.b. [10]

OR

- Q.2 (A) Two wheel loads 12kN and 20kN with fixed distance 2m between them, and 12kN [10] load leading, crosses a beam of span 8m from left to right. Draw the influence line for shear force and bending moment for a section 3m from left support.

- Q.3 (A) Find slope and deflection at B and C for beam as shown in figure 5. [10]

OR

- Q.3 (A) An UDL of 12kN/m and 3m length crosses a simply supported beam from left to right. [10] Draw ILD for SF and BM at section 4m from left support.

Section-2

- Q.4 (A) Draw figures for any 5 type of beam and give SI for each. [05]
(B) An unknown weight falls through 20mm on a collar rigidly attached to the lower end [05] of a vertical bar, 4m long and 25mm in diameter. If the maximum extension is 4mm, what is the corresponding stress and the value of unknown weight? $E=210\text{ kN/mm}^2$.
(C) Draw figures for column end conditions and give effective length for each case. [05]

OR

- (C) A rectangular column 400mm x 300mm is fixed at both ends. $L=6\text{ m}$, $E=1.2 \times 10^5$. [05] Find Euler's crippling load.

- Q.5 (A) Draw load positions for maximum + and - shear for the section, maximum shear and [10] bending in whole beam.

OR

- Q.5 (A) Explain limitation of Euler's formula. [10]

- Q.6 (A) A metallic cantilever beam 150mm x 200mm, 2m span carries a UDL of 50kN/m at [10] free end and 150kN/m at fixed end. Find slope and deflection at free end. $E=100\text{ GPa}$.

OR

- Q.6 (A) A vertical tie rod fixed at top end consist of a steel rod 2.5m long and 20mm diameter encased throughout in a brass tube of 20mm internal diameter and 30mm external diameter. The rod and the casing are fixed together at both ends. The compound rod is suddenly loaded in tension by a weight of 10kN falling freely through 3mm before being arrested by the tie. Calculate the maximum stresses in each material. $E_s=200\text{GPa}$, $E_b=100\text{GPa}$. [10]

-----All the Best-----

Figures

Figure - 1

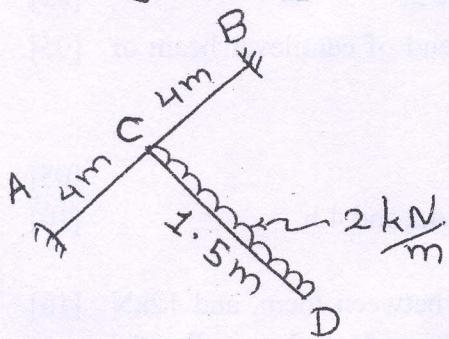


Figure - 2

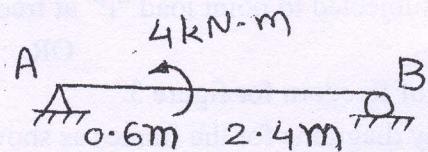


Figure - 3

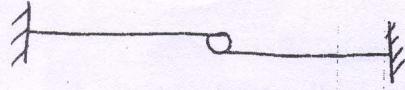
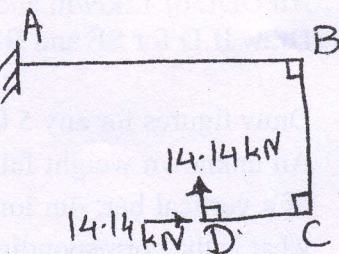
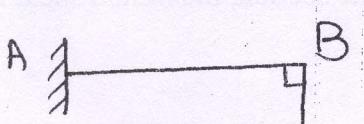


Figure 4-a

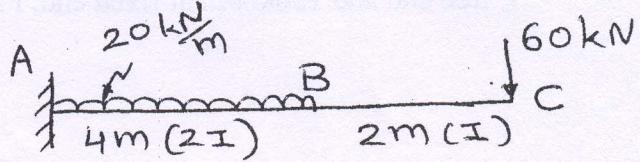


$$\begin{aligned}AB &= 4\text{m} \\BC &= 3\text{m} \\CD &= 2\text{m}\end{aligned}$$



$$\begin{aligned}AB &= 4\text{m} \\BC &= 1\text{m}\end{aligned}$$

Figure - 5



KADI SARVA VISHWAVIDHYALAYA

B.E. 3RD SEMESTER, CIVIL

Subject Code:- CV-305

Subject Name:- Structural Analysis - I

Date:- 25/11/2013,

Time:- 10:00am to 1:00pm

Total Marks:- 70

Instructions:

1. Answer each section in separate answer sheet
2. Use of scientific calculator is permitted
3. All questions are compulsory
4. Indicate clearly, the options you attempt along with its respective question number
5. Use the last page of main supplementary of rough work

Section - I

Q.1 (All compulsory)

- (a) Find SI and KI for any 5 types of beams [5]
- (b) Draw shear force and bending moment diagrams for simply supported beam of 6m span subjected to anticlockwise moment of 10kN.m at the centre of the span. [5]
- (c) Define: Slope, Deflection, Shear force, Influence line, Indeterminate structures [5]

OR

- (c) Find SI and KI of given structure (as shown in figure-1): [5]

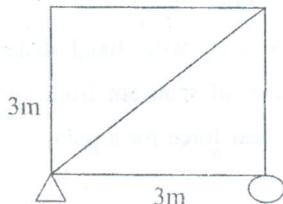


Figure - 1

Q.2 Answer the following question

- (a) A simply supported beam of 8m span is subjected to UDL of 6kN/m on its first half span and subjected to point load of 10kN at the centre of beam. Calculate slope and deflection at the centre of beam.

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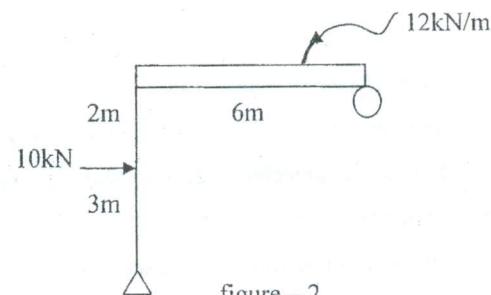
- (b) Draw an influence line diagram of shear force and bending moment for a point 2m away from left support for a simply supported beam of span 8m carries an UDL of 6kN/m of 3m length moving from left to right. [5]

OR

- (a) Find slope and deflection at fixed and free end of cantilever beam of 5m length carries a point load of 10kN at centre. [5]
- (b) Draw an influence line diagram of shear force and bending moment for a point 2m away from left support for a simply supported beam of span 8m carries an UDL of 6kN/m of 12m length moving from left to right. [5]

Q.3 Answer the following question

- (a) Find support reactions for given structure (shown in figure-2) [5]



- (b) Draw shear force and bending moment for structure as shown in figure - 2 [5]

OR

- (a) Two wheel loads of 10kN each with fixed distance 1.5m between them, crosses a beam of span 8m from left to right. Draw an influence line for shear force for a point 2m from left support. [5]
- (b) Two wheel loads of 10kN each with fixed distance 1.5m between them, crosses a beam of span 8m from left to right. Draw an influence line for bending moment for a point 2m from left support. [5]

Section - II

Q.4

- (a) Differentiate frame and truss [5]
- (b) Calculate horizontal deflection of the truss, shown in figure - 1 [5]
if horizontal force of 10kN towards the right is applied at top
right corner.
- (c) A 500 kW power has to be transmitted at 130 r.p.m. by shaft; [5]
the maximum shear stress allowed being 80N/mm^2 .
1. Find the diameter of solid shaft
2. The diameter of hollow shaft whose internal diameter is 0.75
times the external diameter.

OR

- (c) A concrete column of size 250×300 mm is 6m long. Both ends [5]
are fixed. Calculate buckling load by Euler's and Rankine's
formula. Take $E_c = 0.14 \times 10^5 \text{ N/mm}^2$, $\sigma_c = 330\text{N/mm}^2$ and $a =$
 $1/1600$

Q.5 Answer the following question

- (a) A weight of 2kN is dropped on to a collar at the lower end of [5]
vertical bar 3m long and 50mm in diameter. Calculate the
maximum height of drop if the maximum instantaneous stress
is not to exceed 140N/mm^2 . What is the corresponding?
instantaneous elongation? Take $E = 2 \times 10^5$
- (b) Define: Twisting moment, Angle of twist, Shear stress in shaft, [5]
Polar moment of inertia, Shear modulus

OR

- (a) A solid shaft 130mm diameter and 2m long is used to transmit [5]
power from one pulley to another. Determine the maximum
strain energy that can be stored in the shaft, if maximum
allowable shear stress is 60MPa. Take shear modulus as 80GPa
- (b) Explain column end conditions and effective length for each [5]
case with figure.

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Q.6 Answer the following question

- (a) A rectangular column is having width equal to half of the depth. [5]

The length of column is 25 times the width. Calculate slenderness ratio of column.

- (b) Find Member forces in all members of truss (shown in figure-3) [5]

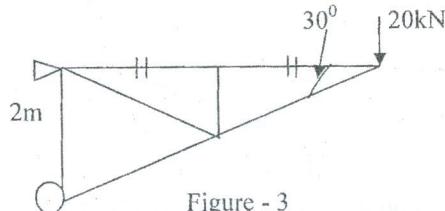


Figure - 3

OR

- (a) A close coiled helical spring is to have a stiffness of 1N/mm of compression under a maximum load of 50N and maximum shear stress is 200N/mm^2 . The solid length of the spring is 50mm. Find the diameter of wire and the number of coils required. Modulus of rigidity = $4.2 \times 10^4\text{N/mm}^2$. [5]

- (b) Draw Shear force and bending moment diagram for cantilever beam of span 4m subjected to clockwise moment of 7kN.m at end. [5]

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KADI SARVA VISHWAVIDYALAYA

B.E. (Civil) Semester-III Examination, May'2014

Subject Code-CV-305

Date: 24/04/2014

Time: 10:30 am to 1:30 pm

Subject: Structural Analysis - I

Total Marks: 70

Instructions:

- (1) Answer each section in separate answer sheet
- (2) Use of scientific calculator is permitted
- (3) All questions are Compulsory
- (4) Indicate **Clearly**, the options you attempt along with its respective questions number.
- (5) Use the last page of main supplementary for **rough work**

Section-I

Q-1 (All Compulsory)

- (A) Define Influence Line and give its importance [5]
- (B) Calculate SI of all types of beams [5]
- (C) Calculate deflection at free end of cantilever beam of span 5m carrying a point load of 5kN at free end. [5]

OR

- (C) Calculate deflection at free end of cantilever beam of span 5m carrying UDL of 5kN/m throughout the span. [5]

Q-2 Answer the following Questions

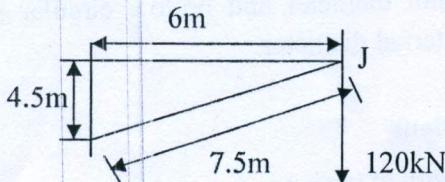
- (A) Draw an ILD for support reactions of simply supported beam carrying moving load of 1kN from left to right [5]
- (B) Draw Shear force and Bending Moment diagram for simply supported beam of span 6m carrying an UDL of 8kN/m throughout the span and point load of 6 kN at centre. [5]

OR

- (A) Explain Maxwell's Reciprocal Theorem [5]
- (B) Give merits and demerits of indeterminate structures. [5]

Q-3 Answer the following Questions

- (A) [5]



Find Vertical deflection at J for 120kN at J.

Area of all members is 1000mm^2 . $E=200\text{kN/mm}^2$

- (B) Write the assumptions made in the theory of truss. [5]

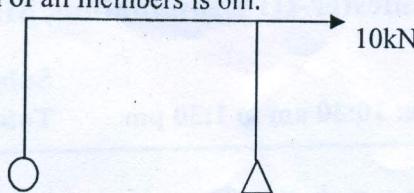
OR

- (A) Define Shear force and Bending moment and give importance of it. [5]

- (B) Draw SFD and BMD for the following frame.

Length of all members is 6m.

[5]



Section-II

Q-4

(All Compulsory)

- (A) An axial pull of 50 kN is suddenly applied to a steel bar 2m long and 1000mm^2 in cross section. If $E=200\text{kN/mm}^2$, find maximum instantaneous stress, maximum instantaneous extension.
- (B) A thin strip of 5mm wide and 0.5mm thick is wound round a cylinder 500mm in diameter. Find strain energy stored in the strip. $E=200\text{kN/mm}^2$
- (C) Derive the equation for strain energy due to gradual loading

[5]

OR

- (C) Derive the equation for strain energy due to sudden loading

[5]

Q-5

Answer the following Questions

- (A) A rectangular column 400 mm wide and 300 mm deep is fixed at both ends. The length of column is 6m. $E=1.2 \times 10^5 \text{ N/mm}^2$. Find Euler's crippling load.
- (B) A solid circular shaft 60 mm diameter transmitting 50kW power at 150 RPM is to be replaced by a hollow circular shaft of the same material. The hollow circular shaft is having external diameter 1.2 times internal diameter. Calculate the size of hollow circular shaft.

OR

- (A) Differentiate Column and strut.
- (B) Compare the torsional resistance of solid circular shaft and hollow circular shaft made from the same material having same cross sectional area. The solid circular shaft is having 60mm diameter and hollow circular shaft is having internal diameter 0.7times external diameter.

[5]

[5]

Q-6

Answer the following Questions

- (A) Write assumptions made in theory of torsion.
- (B) A concrete column of size 230mm x 350 mm is 5m long. Both ends are fixed. Calculate Rankine load. $A=(1/1600)$ and $\sigma_c=300\text{N/mm}^2$, $E_c=0.14 \times 10^5 \text{ N/mm}^2$

[5]

[5]

OR

- (A) Differentiate frame and truss
- (B) Derive torsional formula. $(T/J)=(\tau/R)=(C\theta/L)$

[5]

[5]

***** All the Best*****

KADI SARVA VISHWAVIDYALAYA

B.E. III Semester Examination (NOV-2014)

SUBJECT CODE: CV 305

SUBJECT NAME: STRUCTURAL ANALYSIS I

DATE: 19/11/2014

TIME: 10:30 AM TO 01:30 PM

TOTAL MARKS: 70

Instruction: (1) Answer each section in separate answer sheet.

(2) Use of Scientific calculator is permitted.

(3) Assume the data if it is required.

SECTION-I

- Q.1 A. Draw shear force and bending moment diagram for a cantilever beam of span 5m subjected to uniformly distributed load of 12kN/m throughout the span and concentrated load of 8kN at centre. 5
B. Find deflection and slop at centre for Q.1 A. 5
C. Draw an influence line diagram for support reactions for simply supported beam of span 6m subjected to moving load of 1kN, moving from left to right. 5

OR

- C. Find SI and KI of figure (1-C). 5

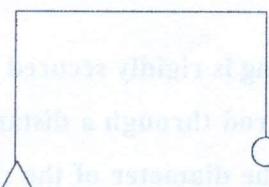


Figure (1-C)

- Q.2 A. Differentiate SI and KI. 5
B. Find slope and deflection at centre of a simply supported beam of 6m span, subjected to uniformly distributed load of 4kN/m throughout the span. 5

OR

- A. Define influence lines and write importance of it. 5
B. Find slope and deflection at free for following figure (2-B) 5

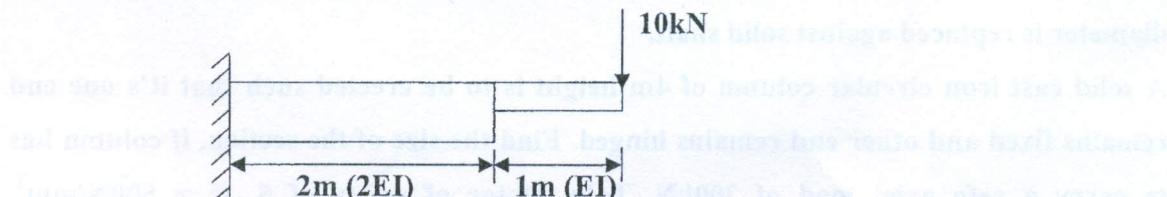


Figure (2-B)

Q.3 A. Find member forces in all members of truss of figure (3-A).

5

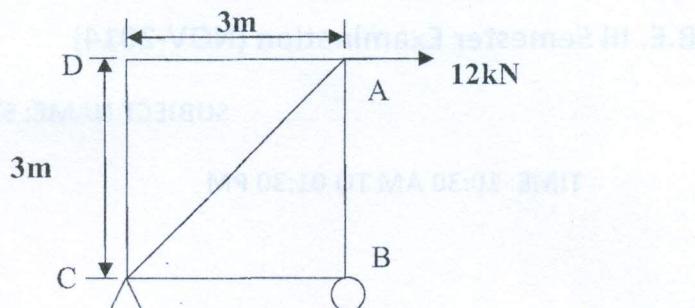


Figure (3-A)

B. Find deflection at point A in form of A, E, I for figure (3-A)

5

OR

A. Define slope and deflection. Write rules of Macaulay's method.

5

B. Draw influence line diagram for shear force and bending moment for simply supported beam of span 6m carrying uniformly distributed load of 2kN/m of length 10m moving from left to right on beam.

5

SECTION - II

Q.4 A. Calculate diameter of the shaft to transmit 10kW at a speed of 10Hz. The maximum shear stress should not exceed 50MPa.

5

B. Define: Radius of gyration, Slenderness ratio, Long column, Crippling load, Crushing load

5

C. A vertical steel rod of uniform diameter, 3m long is rigidly secured at its upper end and weight of 2kN is allowed to slide freely on the rod through a distance of 25mm on to a collar at the lower end of the rod. Calculate the diameter of the rod, if the maximum strain is not to exceed 1/1600. Take $E = 2 \times 10^5$ N/mm².

5

OR

C. A rectangular column is having depth equal to twice the width. The length of column is 20 times more than width. Calculate slenderness ratio of column

5

Q.5 A. A solid steel shaft has to transmit 120kW at 600 r.p.m. Find the diameter of the shaft if the shear stress is to be limited to 100 N/mm². Estimate the possible % saving in the material of the shaft if hollow shaft of internal diameter equals to 0.75 times external diameter is replaced against solid shaft.

5

B. A solid cast iron circular column of 4m height is to be erected such that it's one end remains fixed and other end remains hinged. Find the size of the section, if column has to carry a safe axial load of 300kN. Take factor of safety of 5, $f_c = 500$ N/mm², Rankine's constant = 1/1500.

5

OR

- A. Determine the strain energy stored due to bending in simply supported beam of span 4m subjected to uniformly distributed load of 12kN/m throughout the span. $E = 2 \times 10^5$ GPa, $I = 72 \times 10^4$ mm² 5
- B. Draw conjugate beam of Simply supported beam, Cantilever beam, Over hanging beam, Propped cantilever beam. 5
- Q.6 A. A 35kg collar is released from height h to drop on a disk at bottom end C of the bar ABC. End A of the bar is fixed. Part AB is 3m long and 20mm in diameter. Part BC is 2.5m long and 30mm in diameter. Calculate the height h for which the maximum stress in the rod is 300 MPa. 5
- B. A 2.5m long pin ended column of square cross section is made up of timber. Using Euler's formula, find out size of the column with a factor of safety 2 for 250kN axial load. Consider $E = 12.5$ GPa, Allowable stress in axial compression = 12 MPa. 5

OR

- A. Differentiate 3D Truss and 3D Frame with neat sketch. 5
- B. Cantilever of span 1m carries UDL of 'w' per unit run. Find the strain energy stored in the beam. 5

***** ALL THE BEST *****