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# B.M.S. College of Engineering, Bengaluru-560019

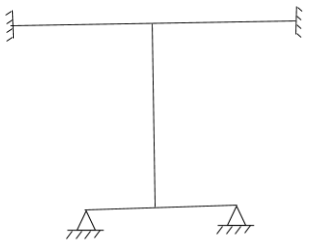
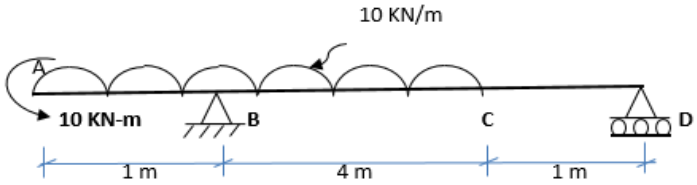
**Autonomous Institute Affiliated to VTU**

## September / October 2023 Semester End Main Examinations

**Programme: B.E.** **Semester: IV**
**Branch: Civil Engineering** **Duration: 3 hrs.**
**Course Code: 22CV4PCSTA** **Max Marks: 100**
**Course: Structural Analysis**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | | UNIT - I | CO | PO | Marks |
|---|---|---|---|---|---|---|
| 1 | a) | | Determine the static and kinematic indeterminacies of the rigid structure shown in FigQ1(a)  FigQ1(a) | CO1 | PO1 | **05** |
| | b) | | With neat sketches explain the various structural forms. | CO1 | PO1 | **05** |
| | c) | | Evaluate the deflection at the end A of the beam shown in FigQ1(c) using Macaulay's method. EI is constant   FigQ1(c) | CO1 | PO1,2 | **10** |
| | | | **UNIT - II** | | | |
| 2 | a) | | A simply supported beam AB of span 8 m carries an udl of 20KN/m acting over a distance of 5 m from the support 'A'. Assuming constant EI, determine the deflection at mid span using Conjugate Beam method. | CO1 | PO1,2 | **12** |
| | b) | | Determine the deflection at the point C for the cantilever beam shown in FigQ2(b) using moment area method. Take EI= 2.5 x $10^4$ KN-$m^2$ | CO1 | PO1,2 | **08** |

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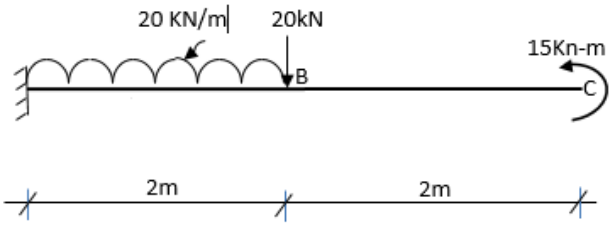
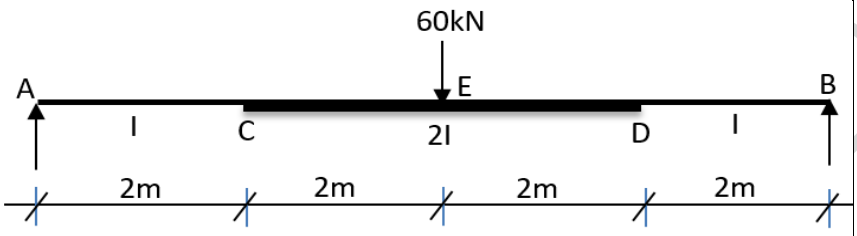
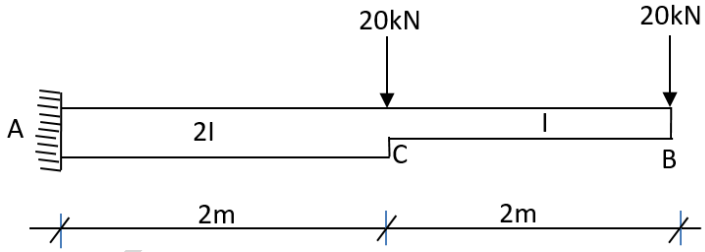
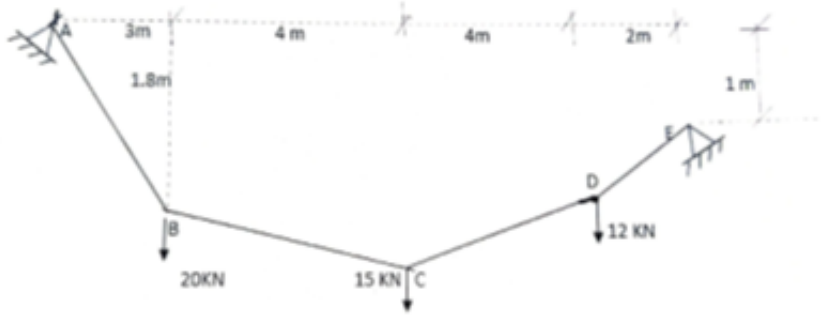
| | | |  FigQ2(b) | | | |
| | | | **OR** | | | |
| 3 | a) | For the beam shown in FigQ3(a) find the deflection at the point 'C' using moment area method.  FigQ3(a) | CO 1 | PO1,2 | **12** |
| | b) | Find the maximum deflection and maximum slope for the beam shown in FigQ3(b) using conjugate beam method. Take E=200 GPa, I=1.2x$10^8$ $mm^4$  FigQ3(b) | CO 1 | PO1,2 | **08** |
| | | | **UNIT - III** | | | |
| 4 | a) | Determine the reaction components at A and B, and the total length of the cable shown in Fig Q4(a). Neglect the self-weight of the cable in the analysis.  Fig Q4(a). | CO 1 | PO1 &2 | **10** |
| | b) | A three hinged parabolic arch of span 36 m and central rise 6 m carries an udl of 30 KN/m over the left half of the span and a point load of 60KN at the crown. Determine the bending | CO1 | PO1 &2 | **10** |

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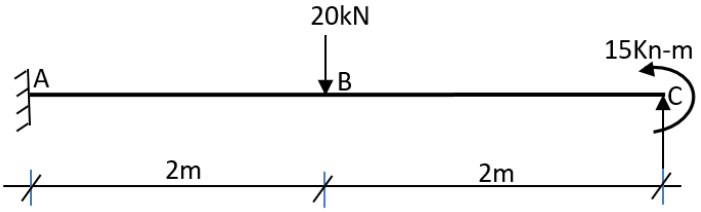
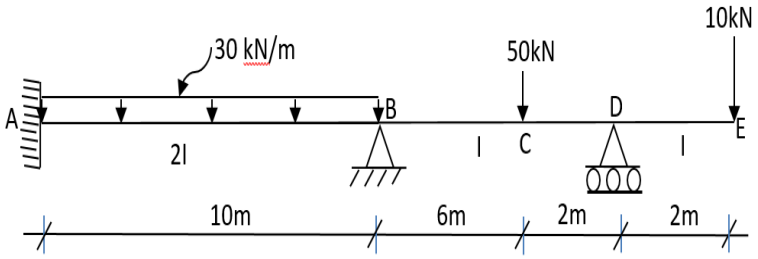
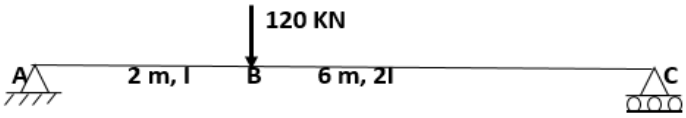
| | | | moment, normal thrust and radial shear at a section 12 from left support. | | | |
| | | | **UNIT-IV** | | | |
| | 5 | a) | Analyze the propped cantilever shown in FigQ5(a) for the reactions by consistent deformation method.<br>  <br><br>FigQ5(a) | CO 1 | PO1& 2 | **06** |
| | | b) | Analyze the continuous beam shown in Fig Q5(b) using Clapeyron's theorem of three moments. The support A sinks by 3 mm and support B sinks by 5 mm. Take E=200 KN/mm$^2$, I=1.8 x 10 $^8$ mm$^{4.}$ Draw BMD, SFD indicating all salient values.<br>  <br><br>Fig Q5(b) | CO 1 | PO 1&2 | **14** |
| | | | **UNIT - V** | | | |
| | 6 | a) | For the beam shown in FigQ5(a) find the deflection under the point load by strain energy principles.<br>  <br><br>FigQ5(a) | CO 2 | PO1 | **10** |
| | | b) | For the rigid frame shown in FigQ6(b), evaluate the horizontal deflection of the point C using strain energy principles. | CO 2 | PO1,2 | **10** |

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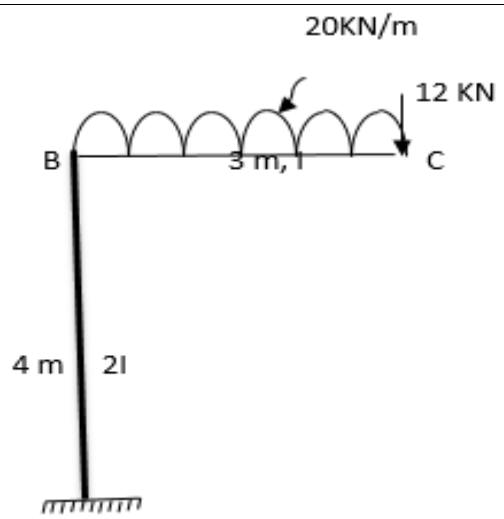
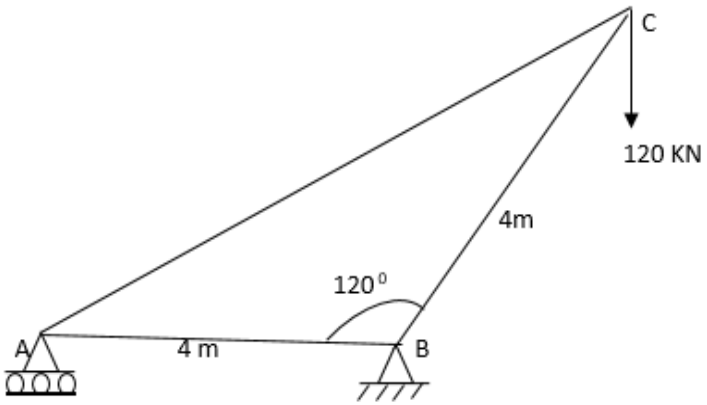
| | | |  FigQ6(b), | | | |
| | | | **OR** | | | |
| | 7 | a) | State and explain the principle of virtual work. | CO 2 | PO1 | **05** |
| | | b) | Determine the horizontal and vertical deflection of the joint C of the pin jointed truss shown in Fig Q 7(b) using unit load method. Assume E=200 GPa and area of cross section of each member as 200 mm $^2$. AB=BC= 4 m  Fig Q 7(b). | CO 2 | PO1,2 | **15** |



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