B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

June, 2013

ET-502(B) : STRUCTURAL ANALYSIS

Time : 3 hours   *Maximum Marks : 70*

Note :   Attempt *any five* questions. *All questions carry equal marks. Use of scientific calculator is **permitted**.*

1.   A three hinged parabolic arch of span 'l' and rise   **14**
     'h' carries a uniformly distributed load of 'w' per
     unit run over the whole span. Show that the

     horizontal thrust is $\dfrac{w\,l^2}{8h}$ and arch is not subjected

     to any BM at any section.

2.   Two wheel loads 10 kN and 20 kN spaced at 2 m   **14**
     apart move along a simply supported girder of
     span 16 m shown in Fig.1. Find the maximum
     bending moment that can occur at a section 6 m
     from the left end. Any wheel load can lead the
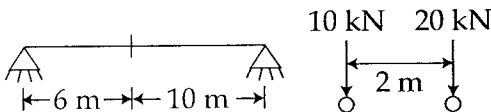   other.

Fig. 1

3. A portal frame ABCD is fixed at A and D, and is **14** loaded as shown in figure - 2.

w kN/m

B ⌢⌢⌢⌢⌢ C
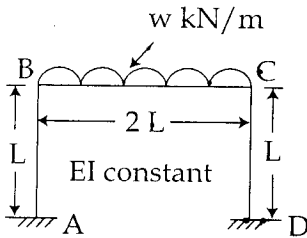|← — 2 L — →|
L   EI constant   L

Fig. 2

Treating joints B and C as rigid, calculate the moments at A, B, C and D. Also draw the bending moment diagram.

4. A beam of span L is fixed at one end and simply **14** supported at the other end as shown in figure - 3.
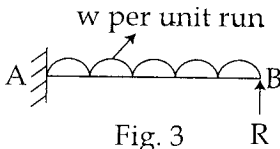
w per unit run

A ⌢⌢⌢⌢⌢ B

Fig. 3   R

It carries a uniformly distributed load of w per unit run over the whole span. Find the reaction at the simply supported end by using strain energy concept.

5. Using Euler's formula, find the ratio of the critical **14** load on a solid circular column to that on a column of hollow circular section of external diameter 1.20 times the internal diameter for the same end conditions, length, material and cross sectional area.

6. (a) Show that shape factor for a circular section   7
is 1.70.

(b) Find the collapse load for the fixed beam   7
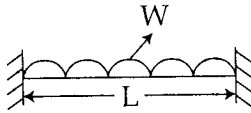loaded with uniformly distributed total load
W as shown in fig. 4.

Fig. 4

The fully plastic moment of the section is
MP.

7. A rectangular body 60 cm long, 10 cm wide and   **14**
4 cm thick is subjected to a shear stress of
750 N/cm^2. Determine the strain energy stored
in it.

Take $G = 0.84 \times 10^6$ N/cm^2.

8. A cable of span L and dip h is subjected to a   **14**
uniformly distributed load w per unit run of
horizontal span. If the dip be considered as small
compared with the span, show that the difference
between the greatest and least tension is
approximately wh.