204 Register No.:

April 2019

Time : Three hours
(Maximum Marks: 75)

N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART – A and PART – B

(2) Answer division (a) or division (b) of each question in PART – C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.]

PART – A

1. Define principle of transmissibility.
2. What is elasticity?.
3. Define factor of safety.
4. What are the stresses are developed in a cylindrical shell due to an internal pressure?
5. Define thin cylindrical shell.
6. What do you mean by strength of a shaft?
7. Define stiffness of the spring.
8. What is sagging moment?

PART – B

9. State and explain triangular law of forces.
10. Define: (i)Limit of proportionality (ii)Bulk modulus (iii)Poisson's ratio.
11. A steel penstock of 1.5m diameter and 15mm thick is subjected to an internal pressure of 15bar. Calculate the hoop stress and longitudinal stress at the bottom of the penstock.
12. What are the different types of beams according to the support conditions?
13. Define section modulus. Write down the expression for rectangular and circular section.

[Turn over....

14. A closely coiled helical spring has the stiffness of 40N/mm. Determine its number of turns, when the diameter of the wire of the spring is 10mm and diameter of the coil is 80mm. Take C = 0.8 X 10^5N/mm^2.

15. Two walls 6 meters apart are stayed together by a steel rod 32mm in diameter and by metal plates and nuts screwed at each end. Then the bar is heated to temperature of 125°C. Calculate the pull exerted by the bar on cooling to atmospheric temperature of 15°C, if the ends yield by 3mm. E=200kN/mm^2 and α =10 X 10^{-6} per °C.

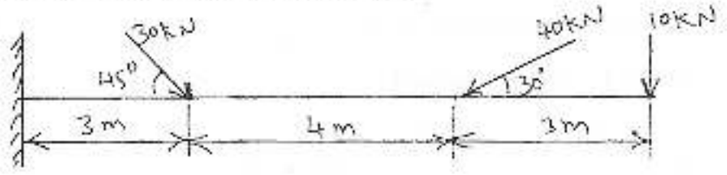
16. Find the torque transmitted by the solid shaft of diameter 0.4m. The angle of twist is not to exceed 1° in a length of 10m. Take C = 0.8 X 10^3N/mm^2.

PART – C

17. (a) The resultant of two concurrent forces is 1500N and angle between the forces is 90°. The resultant makes an angle of 36° with the force. Find the magnitude of each force.

(Or)

(b) Find the support reactions and moment at fixed end of a cantilever beam as shown in figure.



18. (a) A reinforced concrete column 300mm X 450mm has 6 number of 25mm diameter steel bar. Calculate the safe load for the column, if the allowable stress in concrete is 5N/mm^2 and $E_{steel} = 15E_{concrete}$.

(Or)

(b) The modulus of rigidity of a metal is 0.4 X 10^5N/mm^2. A 10mm diameter of the metal is subjected to an axial load of 4.9kN. The change in diameter is found to be 1.95 X 10^{-3}mm. Calculate the Poisson's ratio, Young's modulus and Bulk modulus.

19. (a) Find I_{xx} and I_{yy} of an angle section having flange of 100mm X 10mm size and web of 100mm X 10mm thick.

(Or)

(b) A spherical shell of 1.5m diameter and wall thickness of 10mm. Determine the change in diameter and increase in volume, when it is subjected to an internal pressure of 2N/mm^2. Take E = 2 X 10^5 N/mm^2, 1/m = 0.3.

20. (a) A simply supported horizontal beam 5m long carries concentrated loads of 70kN, 90kN, 50kN and 80kN at distance of 1m, 3m, 4m and 4.5m respectively from the left hand support. Find the reactions and draw SFD and BMD.

(Or)

(b) A test beam of square section 25mm X 25mm is broken by a transverse load of 750N applied at the centre of the span 1m. Using the factor of safety of 4. Calculate the safe udl for a beam of 120mm width and 300mm deep, freely supported over a span of 5m.

21. (a) A hollow shaft of 200mm external diameter, thickness of the metal 20mm is transmitting power at 80 rpm. Angle of twist in a length 3m was found to be 0.7°. Calculate the power transmitted and shear stress developed. Take C=0.8 X 10^5 N/mm^2.

(Or)

(b) A truck weighing 20kN and moving at 6km/hour has to be brought to rest by a buffer. Find how many springs each of 15 coils will be required to store the energy of motion during compression of 200mm. The spring is made out of 25mm diameter steel rod coiled to a mean diameter of 200mm. Take C = 0.945 X 10^5N/mm^2.
