

3rd Mechanical

OK

NILACHAL POLYTECHNIC, BHUBANESWAR

Most Probable Questions

Strength Of Material (MET 301)

Group-A

No of Question (2marks)

(15*2)

1. State Hooke's law (how stress & strain are related within elastic limit)
(2016 W N, 2014, 2010 W, 2009W)
2. Write down the relation between three elastic constants (E,G,K)
(2016 W N, 2015w, 2009w)
3. Define hoop stress and longitudinal stress
(2016W O &N, 2014 BP, 2013W, 2012W,, 2011W,2010W,2009W)
4. Define principal plane & principal stress
(2016W O &N, 2014 BP, 2013W, 2011W, 2010W, 2009W)
5. Define Poisson's ratio and temperature (thermal) stress
(2016W O &N, 2014 BP, 2013W, 2012W,, 2011W,2010W,2009W)
6. What do you mean by pure bending?
(2015W,2014W,2012 W)
7. Define shear force & bending moment
(2016W O &N, 2014 BP, 2013W, 2010W)
8. Define column & bending stress
(2013W,2011 W, 2014W)
9. What is torsional rigidity?
(2015W,2014 W, 2012 W)
10. Define torsion
(2014 BP,2011W,,2010W)
11. What is sectional modulus& flexural rigidity
(2016W O &N, 2014 BP, 2012W,2011W, 2010W)
12. What is crippling load or buckling load.
(2016 W,2012 W,2010W)
13. Define point of contra-flexure.
(2010W,2011W,2012W)
14. Define stress and strain& Strain energy.
(2014 W,2010 W)
15. Define eccentric load and slenderness ratio
(2016W,2014 W)

Group -B

No of Question (5marks)

(13*5)

1. Derive the relation between young's modulus (E), Modulus of rigidity (G) & bulk modulus of elasticity (K).
(2016 W ,2014 W,2013 W,2010 W)
2. Derive the expression for hoop stress and longitudinal stress for a thin cylinder shell under internal pressure.
OR
Explain how a thin cylinder fails due to lack of hoop stress as well as longitudinal stress
(2016W O &N, 2014 BP, 2013W, 2012W, 2011W, 2010W, 2009W)
3. Derive an expression for the stresses on an oblique plane of a rectangular body when it is subjected to direct stress in to mutually perpendicular direction
(2016W N, 2015 W, 2013W,2011W)
4. Derive the principal stresses on a body subjected to two mutually perpendicular direct stresses with a simple shear stress
(2014 W, 2012W)
5. What are the assumptions taken while deriving bending equation under theory of simple bending?
(2014 BP, 2012W, 2010W, 2009W)

NILACHAL POLYTECHNIC, BHUBANESWAR

Most Probable Questions

Strength Of Material (MET 301)

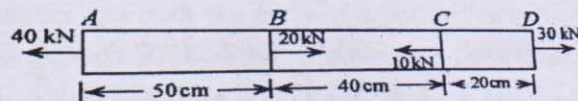
6. Derive the Bending Equation. $\frac{M}{I} = \frac{E}{R} = \frac{\sigma_b}{Y}$ (2016W O &N, 2013W, 2012W)
7. Derive the Relation $\frac{T}{I_p} = \frac{\tau}{R} = \frac{G\theta}{L}$ OR $\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{L}$ (2016W O &N)
8. . What is eccentric loading? How it affects when it is subjected to a column OR Derive maximum stress developed in column under eccentric load. (2015W,2014 W, 2012 W,2011 W)
9. State formulae for crippling load/buckling load under various end conditions. (2016 W N, 2012W, 2010 W, 2009 W)
10. Find expression for temperature stress for a rise in temperature of $t^\circ C$.
I. When the end does not yield. II. When the end is yield by δ Take α coefficient of expansion l is the original length, E - young's modulus (2015 W, 2014 W, 2009 W)
11. Draw The shear Force and bending moment diagram of the cantilever beam of 8m length is loaded with a point load 50 kg at free end and UDL of 10KKg/m over 4 m from fix end . (2015W,2009 W)
12. Two wires of one of steel and other of copper are off same length and are subjected to same tensile load ,if diameter of copper wire is 2mm,find the diameter steel wire if they are elongated by same amount. Take E for steel 200 G Pa and for copper 100 G Pa (2016W)
13. A steel rod 25 mm in diameter and 4 m long is connected to two grips at each end at a temperature of $120^\circ C$. Find the pull exerted when temperature falls to $35^\circ C$. Take $E=2*10^5 N/m^2$, $\alpha_s = 1.2 * 10^{-5}/o_c$ (2011 w)

Group-C

No of Question (5marks)

(13*7)

1. A reinforced concrete column 500 mm *500 mm in section is reinforced with 4 steel bars of 30 mm diameter, one in each corner. The column is carrying a load of 1000 KN. find the stresses in the concrete and steel bars. Take E for steel = 210 G Pa and E for concrete =14 G Pa (2016W N, 2015W, 2012 W, 2009 W)
2. A steel bar 25 mm. diameters is loaded as shown by figure. Determine the stresses in each part and the total elongation.



(2014 W N)

3. A cylindrical shell 2.5 m long and closed at the ends has an internal diameter of 1.25m and wall thickness of 20mm. Calculate the change in dimensions when subjected to an internal pressure of 1.5 M Pa. Take $E=200$ G Pa and $\frac{1}{m} = 0.3$

(2016W O &N, 2015 WN, 2014 BP, 2014 W N, 2012W, 2010W)

NILACHAL POLYTECHNIC, BHUBANESWAR

Most Probable Questions

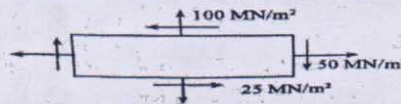
Strength Of Material (MET 301)

4. A cylindrical vessel 2mt.long and 500mm in diameter with 10mm thick plate is subjected to an internal pressure of 3MPa. Calculate the change in volume of vessel. Take $E=200$ GPa, poisson's ratio 0.3 for vessel material (2016 W,2013 W,2009 W)

OR

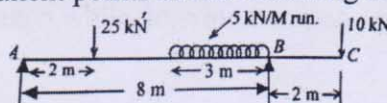
A concrete column of 350 mm diameter is reinforced with 4baars of 25 mm diameter. Find the stress in steel when the concrete is subjected to a stress of 4.5 MPa. Find the safe load the column can carry. Take $E_s/E_c = 18$. (2016 WN, 2011 W)

5. a point in strained material is subjected to a tensile stress of 140 M Pa and a clockwise shear stress of 40 M Pa. What are the values of normal and shear stresses on a plane inclined 30° with the normal to the tensile stress. (2016W, 2015W, 2012 W)
6. A point in a material is subjected to a stress as shown below. Calculate (I) the principal stresses (ii) Maximum shear stress and also the plane along which it acts.(2014 W , 2009 W)



7. A solid circular shaft transmits 75KW power at 200 rpm. Calculate the shaft diameter if the twist in shaft is not to exceed 1° in 2 m length of shaft and shear stress is limited to 50 MN/M². Take $Cor G=100GN/M^2$ (2013W,2012 W,2011 W,2010 W)
8. What diameter of shaft will be required to transmit 80KW at 80 rpm if the maximum torque is 30 percent more than the mean and the limit of torsional stress is to be 56 M Pa (2014 W, 2016 W)
9. A short column of dia. 2m is subjected to a compressive load of 2 tons at an eccentricity of 5 cm from Us axis. Find the maximum stress developed sketch the distribution of stress across the section. (2014 W N ,2016 W)
10. A rectangular beam 8cm * 6 cm is 2m long and is simply supported at the ends. If carries a load of 3 KN at Mid-span. Determine the maximum bending stress induced in beam (2014 w BP)
11. A steel bar of 80 cm long,20 cm wide and 10 cm thick is subjected to a load of 120KN (tensile) in the direction of length and 60 KN (compressive) in the direction of width .determine the change in length ,width, thickness and volume of bar. Take $E=200$ G Pa Poisson's ratio as 0.25. (2016 W,2010 W)
12. Aluminum rod of 20 mm diameter is completely enclosed in a steel tube of 30 mm external diameter and both the ends of assembly are rigidly connected. if the composite bar is heated through 50° C. Find the stresses developed in the aluminum rod and steel tube. Take $E_s=200$ G Pa, $E_{al}=80$ G Pa, $\alpha_s = 12 * 10^{-6} /o_C$, $\alpha_{al} = 18 * 10^{-6} /o_C$ (2016&O, 2014 W BP,)

13. Find out the S.F and B.M at salient points of the following loaded beam and draw the S.F and



B.M diagram

(2014W,2016 W N)

[Handwritten signature]
1/6/17