| **Paper Code: ME-302** | **oll No.** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|

**B.TECH**
**(III SEM) ODD SEMESTER EXAMINATION (2016-17)**
**STRENGTH OF MATERIALS**

**[Time: 3 hr]** **[Max.Marks:100]**

**Note: Attempt all questions, all questions carry equal marks.**

**Q.1.** **(a)** The principal stresses at a point are 45 $N/mm^2$ tension and 75 $N/mm^2$ tension. Working from first principles, determine for a plane at $40^o$ to that of the latter stress: i.) the magnitude and angle of obliquity of the resultant stress, ii.) The normal and tangential component stresses. **(7)**
**(b)** What is the assumption on which "Theories of Failure" are based? Name all the Theories of failure. **(5)**
**(c)** Drive and discuss Castgliano's Theorem. **(8)**

**Q.2.** **(a)** Show that the difference between the maximum and mean shearing stress in web of an I-section is $Fd^2/24I$, where d is the height of the web. **(6)**
**(b)** A beam of 6m span, fixed horizontally at the ends, supports concentrated loads of 80kN and 40kN at 2.25 m and 4.5 m respectively from left-hand end. Calculate the central deflection if $I = 5500cm^4$ and $E = 204{,}000\ N/mm^2$. **(8)**
**(c)** A shaft 3m long stores 300Nm of energy when transmitting 1500kW at 360 r.p.m. What is the shaft diameter and Maximum shear stress? $G = 80{,}000N/mm^2$. **(6)**

**Q3.** **(a)** A cantilever leaf spring of length 0.43 m has four leaves of thickness 9mm. If an end load of 2.5kN causes a deflection of 36mm find the width of the leaves. $E = 200{,}000\ N/mm^2$. **(9)**
**(b)** Derive an expression for buckling load on a column fixed at both the ends. **(7)**
**(c)** Explain the limitation of Euler Theory. **(4)**

**Q.4** **(a)** A thin cylindrical shell, 1.5 m internal diameter, 2.4 m long, internal volume $4.23m^3$ , plates 25mm thick, is under internal pressure of $1N/mm^2$. Assuming the end plates are rigid, find the changes in length, diameter, and volume. $E = 206{,}000N/mm^2$; $\nu = 0.267$. **(8)**
**(b)** Derive an expression for Hoop stress and Radial stress in thick Spheres. **(8)**
**(c)** Writ a short note on stresses due to interference fits. **(4)**

**Q.5** **(a)** A steel ring of rectangular cross-section 7.5 mm wide by 5 mm thick has a mean diameter of 300 mm. A narrow radial saw cut is made, and tangential separating forces of 1N each are applied at the cut in the plane of the ring. Find the additional separation due to theses forces. $E= 206, 000N/mm^2$. **(8)**
**(b)** What is shear center? Explain with the help of a suitable example. **(4)**
**(c)** What is unsymmetrical bending? Explain in brief how neutral axis can be located. **(8)**