Exam Topic Area: Solid Mechanics and Machine Design

Questions on the exam will be thought-provoking, but can be solved with a thorough understanding of the underlined foundations of the topic area. Question difficulty will generally be at the level of challenging undergraduate material, and often require understanding and application of multiple concepts to come to the correct solution.

Questions will test the student's ability to solve problems related to stress and strain in deformable solids and application of failure theories in design of components.

Reference List:

- Beer, F.P., Johnston, E.R., DeWolf, J.T. and Mazurek, D.F., "Mechanics of Materials", 7th Edition, McGraw Hill (Chapters 1-11)
- Budynas, R.G. and Nisbett, J.K., "Shigley's Mechanical Engineering Design", 10th Edition, McGraw Hill (Chapters 3-7)

Questions will be drawn from the following list of topics:

- Stress and strain in components undergoing axial, torsion, and bending
- Thermal stresses, hoop stresses, cylindrical pressure vessels
- Combined loading
- Cartesian stress components, transformation of stresses, 3D stress tensor, principal stresses
- Columns and buckling
- Shear and bending moment diagrams; singularity functions
- Energy methods and Castigliano's Theorem
- Stress concentrations
- Failures theories for static or fatigue loading

Undergraduate courses offered in this area:

Courses listed here are for your reference only and may be helpful for relearning/reviewing the material. Questions on the exam are limited by the topics list and reference list, not by the material covered in this (these) course(s):

- EM 302 – Mechanics of Deformable Solids
- ME 344 – Mechanical Design