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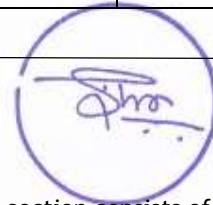
Branch: Signature of Invigilator:

Semester: VIth Date: 29/04/2022 (MORNING)

Subject with Code: ME385 THEORY OF ELASTICITY

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE



1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. Candidates should write their roll no. in each page of the booklet.
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to submit the question paper cum answer sheets before leaving the examination hall.

CLASS: B. Tech.
BRANCH: Mechanical

SEMESTER: 6
SESSION: SP/22

SUBJECT: ME 385 – Theory of Elasticity
TIME: 2 Hrs

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 15 MCQs in Section-I each carrying 2 marks, and 5 subjective questions in Section-II each carrying 5 marks.
 2. Candidates must attempt all the MCQs, a total of which carries 30 marks.
 3. For subjective questions, four out of five questions must be attempted, a total of which will carry 20 marks.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
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Section – I

1. Body forces are the forces
 - (a) That are applied to the body by physical contact
 - (b) That are applied on the surface of the body that redistributes itself over the entire body
 - (c) That acts over the entire volume by the external forces, not in direct contact with the body
 - (d) None of the above
2. The theory of elasticity is based on
 - (a) The concept of continuum
 - (b) Discrete formulations
 - (c) Both (a) & (b)
 - (d) None of the above
3. Principal stresses represent
 - (a) The maximum value of stresses
 - (b) The minimum value of stresses
 - (c) Both (a) & (b)
 - (d) None of the above
4. In the Mohr's circle for strain, the axis for the plots is
 - (a) σ vs τ
 - (b) γ vs ϵ
 - (c) $1/2\gamma$ vs ϵ
 - (d) None of the above
5. The hydrostatic state of stress is responsible for a change in
 - (a) The aspect ratio
 - (b) The shape
 - (c) The volume
 - (d) All the above
6. Deviatoric stress is responsible for a change in
 - (a) The aspect ratio
 - (b) The volume
 - (c) All the above
 - (d) None of the above

7. In the real field, the roots of the cubic equation are
- All real
 - All imaginary
 - Could be real as well as imaginary
 - None of the above
8. The first invariant of the deviatoric component of stress is
- A positive number
 - Zero
 - A negative number
 - Could be zero or a non-zero number
9. If I_2^h and I_2^d are the first invariants of homogeneous as well as deviatoric stresses, respectively, which of the relations is true
- $I_2^h + I_2^d = I_2^{hd}$
 - $I_2^h - I_2^d = I_2^{hd}$
 - $I_2^h + I_2^d = I_2$
 - $I_2^h + I_2^d = I_2^p$
10. If I_1 and I_2 are the stress invariants, then the octahedral stresses are represented by the following relation
- $\tau_{oct} = \sqrt{\frac{4}{9}I_1^2 + \frac{2}{3}I_2}$
 - $\tau_{oct} = \sqrt{\frac{16}{9}I_1^2 + \frac{2}{3}I_2}$
 - $\tau_{oct} = \sqrt{\frac{4}{9}I_1^2 - \frac{2}{3}I_2}$
 - $\tau_{oct} = \sqrt{\frac{2}{9}I_1^2 - \frac{2}{3}I_2}$
11. The strain compatibility equations are used to
- Satisfy the condition of the real field
 - Satisfy the condition of strain transformation
 - Both (a) & (b)
 - None of the above
12. The strain compatibility equation comes into the picture since
- There are six equations and three unknowns
 - There are six equations and six unknowns
 - Both (a) & (b)
 - None of the above
13. The expression for the normal stresses using generalized Hooke's law in terms of Lamé's constants λ and ν is
- $\sigma_i = \lambda e - 2\mu\epsilon_i$
 - $\sigma_i = \lambda e + 2\mu\epsilon_i$
 - $\sigma_i = \lambda e \pm 2\mu\epsilon_i$
 - None of the above
14. According to Saint Venant's principle, if a point load is applied on the surface of the body, then
- This force will have the same intensity throughout the body
 - This force will have the same intensity over the entire surface of the body
 - This force will have an intensity varying uniformly along with the depth inside the body
 - This force will have maximum intensity near the region of the applied load and becomes uniform after a small distance from the point of application of the load

15. The modulus of resilience is the energy absorbed by the body
- (a) Within the elastic region
 - (b) Within and beyond the elastic region
 - (c) Beyond the plastic region
 - (d) None of the above

Section II

Q.1 Derive an expression for shear and normal octahedral stresses. [5]

Q.2 For a given state of stress, determine the principal stresses [5]

$$\tau_{ij} = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

Q.3 What is Saint-Venant's equation of compatibility? [5]

Q.4 Write down the solution of the third-order polynomial in Airy's function. [5]

Q.5 For the cantilever of total length L shown in Fig. 1, determine the deflection at end A. Neglect shear energy. [5]

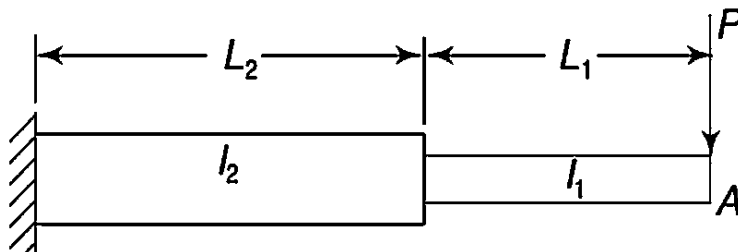


Fig. 1