Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17CE2067** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
| **PART – A (20 X 1 = 20 MARKS)** | | | |
| 1. | The unit of stress in SI unit is \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO1 | 1 |
| 2. | The ratio between change in dimension to proginal dimension is called as \_\_\_\_\_\_\_\_\_\_\_\_. | CO1 | 1 |
| 3. | The young’s modulus of steel is \_\_\_\_\_\_\_\_\_\_\_\_. | CO1 | 1 |
| 4. | Define Poisson’s ratio. | CO1 | 1 |
| 5. | Mention the relation between modulus of elasticity and modulus of rigidity. | CO1 | 1 |
| 6. | Differentiate between determinate and indeterminate beams. | CO2 | 1 |
| 7. | List the types of beams. | CO2 | 1 |
| 8. | Infer Point of contraflexure. | CO2 | 1 |
| 9. | Draw the shape of the shear force diagram for a cantilever beam with a concentrated load acting at the free end. | CO2 | 1 |
| 10. | Draw the bending moment diagram for a simply supported beam with UDL acting at the entire length of the beam. | CO2 | 1 |
| 11. | Illustrate the concept of pure bending or simple bending. | CO3 | 1 |
| 12. | Define the Pure bending equation. | CO3 | 1 |
| 13. | Unit of moment of inertia is \_\_\_\_\_\_\_\_\_\_\_\_. | CO3 | 1 |
| 14. | Define shear stress generalized equation. | CO3 | 1 |
| 15. | Give the expression of Clapeyron’s theorem of three moments. | CO4 | 1 |
| 16. | Draw a typical shear force diagram for a fixed beam with concentrated load acting at the centre of the beam. | CO4 | 1 |
| 17. | Infer the type of failure of long and short column. | CO5 | 1 |
| 18. | Write the expression for crippling load of a column when its both ends are hinged. | CO5 | 1 |
| 19. | State the expression of deflection for a simply supported beam carrying a point load at the centre. | CO6 | 1 |
| 20. | Flexural Rigidity is \_\_\_\_\_\_\_\_\_\_\_\_. | CO6 | 1 |

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| **PART – B (10 X 5 = 50 MARKS)**  **(Answer any 10 from the following)** | | | |
| 21. | Find the minimum diameter of a steel wire, which is used to raise a load of 4000 N if the stress in the rod is not to exceed 95 MN/m2. | CO1 | 5 |
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| 22. | Determine the Young’s modulus of a rod of a diameter 30 mm and of length 300 mm which is subjected to a tensile load of 60 kN and the extension of the rod is equal to 0.4 mm. | CO1 | 5 |
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| 23. | Determine the changes in length, breadth and thickness of a steel bar which is 5m long 40 mm wide and 30mm thick and is subjected to an axial pull of 35 kN in the direction of its length. Take E = 2 ×105 N/mm2 and Poisson’s ratio 0.32. | CO1 | 5 |
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| 24. | Draw the shear force and bending moment diagram for a simply supported beam of length 8 m and carrying a uniformly distributed load of 5 kN/m for a distance of 5m from the left end. | CO2 | 5 |
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| 25. | Draw the shear force and bending moment diagram for Cantilever beam of length 6 m and carrying a uniformly distributed load of 5 kN/m for a distance of 3m from the left end and concentrated load of 4 kN acting at the extreme free end. | CO2 | 5 |
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| 26. | A rectangular beam 200 mm deep and 300 mm wide is simply supported over a span of 8 m. What uniformly distributed load per metre the beam could carry, if the bending stress is not to exceed 120 N/mm2. | CO3 | 5 |
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| 27. | A circular beam of 100 mm diameter is subjected to a shear force of 5 kN. Calculate average shear stress, maximum shear stress and shear stress at a distance of 40 mm from NA. | CO3 | 5 |
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| 28. | Draw the typical bending moment and shear force diagram for fixed beam carrying uniformly distributed load through out the length of the beam. | CO4 | 5 |
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| 29. | Draw the typical bending moment and shear force diagram for a two span continuous beam carrying uniformly distributed load through out the length of the beam. | CO4 | 5 |
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| 30. | A column of timber section 15 cm x 20 cm is 6 m long both ends being fixed. If the young’s modulus for timber = 17.5 kN/mm2, determine crippling load and safe load if factor of safety is 3. | CO5 | 5 |
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| 31. | A hollow mild steel tube 6 m long and 4 cm internal diameter and 5 mm thick is used as a strut with both ends hinged. Find the crippling load and safe load taking factor of safety as 3. Take E = 2 x 105 N/mm2. | CO5 | 5 |
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| 32. | A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries an uniformly distributed load of 9 kN/m run over entire span of 5 m. If the value of E for the beam material is 1 × 105 N/mm2, find the slope of the supports and maximum deflection. | CO6 | 5 |

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| **PART – C (2 X 15 = 30 MARKS)**  **(Answer any 2 from the following)** | | | | |
| 33. | a. | Draw the shear force and bending moment diagram for the cantilever beam shown in the figure. | CO2 | 10 |
| b. | Determine the value of Young’s modulus and Poisson’s ratio of a metallic bar of length 25 cm, breadth 3 cm and depth 2 cm when the bar is subjected to an axial compressive load of 240 kN. The decrease in length is given as 0.05 cm and increase in breadth is 0.002 cm. | CO1 | 5 |
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| 34. | a. | Draw the bending moment and shear force diagram for the continuous beam shown in the figure. | CO4 | 10 |
| b. | A beam is simply supported and carries a uniformly distributed load of 40 kN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm2 and moment of inertia of the section is 7 × 108mm4, find the span of the beam. | CO3 | 5 |
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| 35. | a. | A solid circular bar 5 m long and 4 cm in diameter was found to extend 4.5 mm under a tensile load of 48 kN. The bar is used as a strut with both ends hinged. Determine the buckling load for the bar and also the safe load taking factor of safety as 3.0. | CO5 | 8 |
| b. | A cantilever 150 mm wide and 250 mm deep is 2.5 m long. What is the uniformly distributed load which the beam can carry in order to produce a deflection of 5 mm at the free end? Take E = 200 GN/m2. | CO6 | 7 |