R16

II B.TECH I SEM

SUPPLEMENTARY EXAMINATIONS

APRIL 2025

# Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

**Subject Code: R16CE2106**

## II B.Tech I Semester Supple Examinations, April-2025

### MECHANICS OF SOLIDS

### (CE)

**Time: 3 hours** **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

## PART-A

1. (a) Draw the stress-strain curve for mild steel and indicate salient points.
   (b) Demonstrate the section modulus of rectangular and circular sections?
   (c) Outline the definition of roller support and hinged support.
   (d) Infer the concept of shear force in beams.
   (e) Summarize the advantages of I-Section.
   (f) Define short and long columns.

**[2+2+2+2+2+2]**

## PART-B

**4 X 12 = 48**

2. (a) A steel rod of 40 mm diameter is fitted in a copper tube of 60 mm external diameter and 40 mm internal diameter. The assembly is completely fixed at one end while the other end is constrained in cross-section by a rigid plate. If the temperature of the assembly is raised by $60^0$C, Calculate the stresses developed in copper and steel. Consider the following material properties. Young's modulus for steel = 200 GPa; Young's modulus for copper = 100 GPa; Coefficient of Thermal Expansion for steel = $12 \times 10^{-6}$ per $^0$C; Coefficient of Thermal Expansion for copper = $18 \times 10^{-6}$ per $^0$C;
   (b) How are the temperature stresses developed?

3. (a) A bar of 20 mm. diameter is subjected to a pull of 75 kN. The extension measured on a gauge length of 200 mm is 0.1 mm and the change in diameter is 0.004 mm. Find Poisson's ratio and values of three moduli.
   (b) Derive an equation for the relation between three elastic moduli.

4. (a) A simply supported beam of span 15 m carries as UDL of 10 KN/m over a length of 6 m from left support and also from right support. Draw SF and BM diagrams.
   (b) A beam of length 15 m has an overhanging of 5 m on left and right leaving the span between the supports of 6 m. It carries a UDL of 8 KN/m over the entire length and a concentrated load of 10 KN at the right extreme end. Draw SF and BM diagrams and find the point of contra flexure point.

5. (a) The tension flange of a cast iron I section beam is 240 mm wide and 50 mm deep, the compression flange is 100 mm wide and 20 mm deep whereas the web is 300 mm deep and 30 mm thick. Find the load per unit run that can be carried over a 4 m span of a simply supported beam if the maximum permissible stresses are 90 MPa in compression and 24 MPa in tension.

   (b) A rolled steel Joist of I-Section has a flange length of 300 mm. wide and 20 mm thick with a web thickness of 20 mm. and the overall depth of I-Section is 600 mm. If this beam carries a UDL of 40 KN/m over the simply supported beam of span 10 m, find the maximum stress produced in the beam.

6. (a) Explain Euler's theory. And explain its assumptions and limitations.

   (b) A thick cylinder shell of 300 mm inside diameter is to withstand an internal pressure of 30Mpa. The allowable tensile stress for the material of the shell is 150Mpa. Determine the thickness of the shell based on the following theories of failure neglecting the longitudinal direct stress:

   i. Maximum principal stress theory
   ii. Maximum shear stress theory
   iii. Maximum principal strain theory
   iv. Maximum strain energy theory Poisson's ratio =0.3.

7. (a) A hollow shaft having an internal diameter of 50% of its external diameter transmits 600 kW of power a 200 rpm. Determine the external diameter of the shaft if the shear stress is not to exceed 65 MPa and the twist in the length of the 3 m shaft should not exceed 1.5 degrees. Take the modulus of rigidity = 100 GPa.

   (b) A circular shaft of 12 cm dia. is subjected to combined bending and twisting moments. The bending moment is three times the twisting moment. If the direct tensile yield point of the material is 350 MN/m2 and the factor of safety on yield is 4, find the allowable twisting moment by i) Maximum principal stress theory and ii) Maximum shear stress theory.

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# Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

**Subject Code: R16ME2101**

## II B.Tech I Semester Supple Examinations, April-2025

### BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

### (ME)

**Time: 3 hours** **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

## PART-A

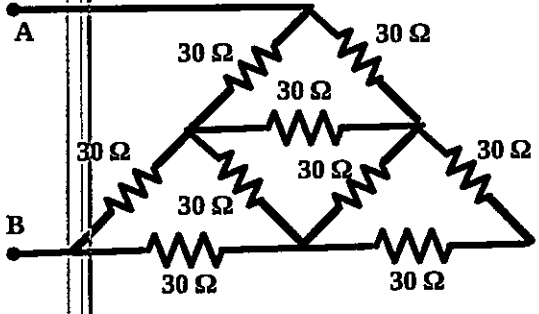
1. (a) List out the limitations of Ohms Law.
   (b) List the applications of DC series, shunt and compound motors.
   (c) Derive the EMF equation of single-phase transformer.
   (d) Define slip and slip frequency of three-phase induction motor.
   (e) Draw the V-I characteristics of PN junction diode.
   (f) List the applications of OP-AMPS.

**[2+2+2+2+2+2]**

## PART-B

**4 X 12 = 48**

2. (a) Write the properties of an inductor and derive the energy stored by the inductor.
   (b) What is the significance of star/delta transformation and find an equivalent resistance between A and B in the network shown below using star-delta transformation, consider all the resistors are 30 Ω.




3. (a) Classify the DC generators according to their excitation and explain each of them with neat sketches.
   (b) A 500 V, 25 hp, DC shunt motor takes 2.4 A at no load. The field and armature resistances are 650 Ω and 0.57 Ω respectively. Calculate full load efficiency, assuming a brush drop of 2 V.

4. Discuss how to conduct open-circuit and short-circuit tests on a single-phase transformer in the laboratory. From the test results how the efficiency and voltage regulation of the transformer is determined? **[12M]**

5. (a) Differentiate the salient-pole and non-salient-pole alternators in any six aspects.
   (b) Draw and explain the torque-slip characteristics of three-phase induction motor.

6. (a) Explain the operation of single-phase full wave bridge rectifier and plot the related output waveforms.
   (b) With the help of a neat sketch explain the single stage CE amplifier.

7. (a) With the help of neat sketches, explain the characteristics of OP-AMPS.
   (b) Explain about OP-AMP as integrator and draw the relative diagrams.

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# Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

**Subject Code: R16ME2102**

## II B.Tech I Semester Supple Examinations, April-2025

### MECHANICS OF SOLIDS

### (ME)

**Time: 3 hours** **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

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## PART-A

1. (a) Draw typical stress-strain diagram for Cast Iron.
   (b) Describe the effect of couple on the S.F and B.M diagram of a beam.
   (c) State Mohr's theorem.
   (d) Find an expression for section modulus of a rectangular section of a beam.
   (e) Which ratio decides whether cylinder is thin or thick.
   (f) What do you mean by Lame's equations.

**[2+2+2+2+2+2]**

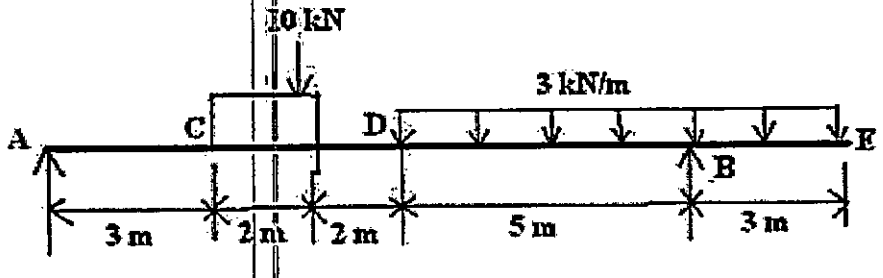
## PART-B

**4 X 12 = 48**

2. (a) An element in a strained body is subjected to a compressive stress of 200 MPa and a clockwise shear stress of 50 MPa on the same plane. Calculate the values of normal and shear stresses on a plane inclined at 35° with the compressive stress. Also calculate the value of maximum shear stress in the element.**(6 Marks)**

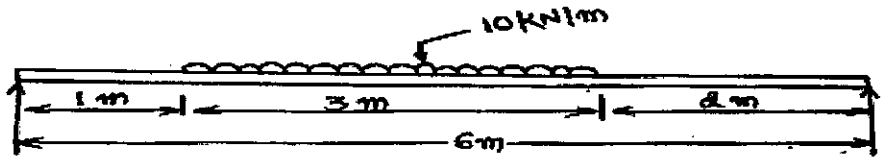
   (b) A round bar of length L and diameter D is subjected to an axial pull P. Find the change in volume of the bar. Poisson's ratio = 1/m, young's modulus = E. **(6Marks)**

3. A simply supported overhanging beam is load as shown in the Figure. Draw the shear force and bending moment diagrams. **(12 Marks)**




4. (a) Derive the bending equation. **(8 Marks)**
   (b) How would you find the bending stress in unsymmetrical section. **(4 Marks)**

5. A beam of length 6 m is simply supported at its ends. It carries a uniformly distributed load of 10 KN/m as shown in figure. Determine the deflection of the beam at its midpoint and also the position and the maximum deflection. Take EI= 4.5 x$10^8$ N/$mm^2$ **(12 Marks)**




6. A thin cylindrical shell 2.5m long has 700 mm internal diameters and 8mm thickness, if the shell is subjects to an internal pressure of 1Mpa, find (i) The hoop and longitudinal stresses developed (ii) Maximum shell stress induced and (iii) The change in diameter, length and volume. Take modulus of elasticity of the wall material as 200Gpa and poison's ratio as 0.3. **(12 Marks)**

7. (a)What is equivalent length and crippling load of a column? How these concepts used in the column theory? Explain. **(6 Marks)**

   (b) Write short notes on Slenderness ratio and limitation of Euler's formula. **(6 Marks)**

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# Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

**Subject Code: R16ME2105**

## II B.Tech I Semester Supple Examinations, April-2025

## THERMODYNAMICS

**(ME)**

**Time: 3 hours** **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

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**PART-A**

1. a) Discuss first law of thermodynamics.
   b) What is second law of thermodynamics? Write the importance
   c) What do you understand by perfect gas? Give few examples
   d) Define COP of a heat pump.
   e) Write Carnot theorem.
   f) Draw the line diagram of Brayton Cycle. Write applications

**[2+2+2+2+2+2]**

**PART-B**

**4 X 12 = 48**

2. a) What is thermal equilibrium? And explain the construction of temperature scales.
   b) A quantity of air having a volume of $0.03m^3$ at a temperature of 200°C and pressure of 150 $N/m^2$ is expanded at constant pressure to $0.06m^3$; it then expanded adiabatically to $0.12m^3$. Find (i) Temperature and pressure at the end of the adiabatic process. (ii) Work done during each stage assume $\gamma = 1.41$.

3. a) Derive an expression for the First Law of thermodynamics applied to a closed system undergoing cyclic process.
   b) 325 kJ of heat is supplied to a system at constant volume. System rejects 365 kJ of heat at constant pressure and 100 J of work is done on it. The system is brought to an initial state by an adiabatic work. Calculate the values of internal energy at all state points. Take initial value as 400 J.

4. a) Explain about inequality of Clausisus.
   b) Calculate the entropy change of the universe as a result of the Following processes: (i) A copper block of 600 grams mass and with Cp of 150 J/kg-K at $100^0$C is placed in a lake at $8^0$C (ii) Two such blocks at $10^0$C and $0^0$C are joined together.

5. a) Draw the P-V, T-S, H-S diagrams of a pure substance (steam) and explain how it is formed.
   b) 10 kg of water at 45°C is heated at a constant pressure of 10 bar until it becomes superheated vapour at 300°C. Find the change in volume, enthalpy, internal energy and entropy.

6. a) State and prove Daltons law of partial pressures.
   b) One kg of air in a closed system, initially at 5°C and occupying 0.3 $m^3$ volume, undergoes a constant pressure heating process to 100°C. There is no work other than PdV work. Find (a) the work done during the process, (b) the heat transferred, and (c) the entropy change of the gas.

7. a) Explain the working of Otto cycle and derive the expression for thermal efficiency.
   b) Explain the working of vapour compression refrigeration cycle.

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# Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

**Subject Code: R16EC2106**

## II B.Tech I Semester Supple Examinations, April-2025

### ELECTRICAL AND MECHANICAL TECHNOLOGY

**(ECE)**

**Time: 3 hours** **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

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## PART-A

1. (a) Define the voltage regulation of a transformer?
(b) A 06 pole, three phase induction motor operating on a 50 HZ supply has rotor EMF frequency as 2 HZ, determine slip?
(c) Define the term controlling torque?
(d) What do you understand by forging?
(e) What are the Radiative properties?
(f) What are the applications of gears?

**[2+2+2+2+2+2]**

## PART-B

**4 X 12 = 48**

2. How are DC motors started? Draw a neat diagram of the three point starter used for DC shunt motor? **[12M]**

3. (a) Explain the principle of working of a three phase induction motor? **[6M]**
(b) Draw the slip-torque characteristic of a three phase slip ring induction motor? **[6M]**

4. Explain various functions of CRO? **[12M]**

5. Discuss the a) Arc welding b) Gas welding **[12M]**

6. (a) Explain the effect of extended surfaces on heat transfer? Discuss in detail the classification of fins with neat sketch? **[6M]**
(b) Write short notes on thermal radiation? **[6M]**

7. (a) What are the classifications of gears? **[6M]**
(b) Explain the merits and demerits of rope for transmission of power? **[6M]**

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# Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

**Subject Code: R16CS2106**

## II B.Tech I Semester Supple Examinations, April-2025

## FORMAL LANGUAGES AND AUTOMATA THEORY

## (CSE)

**Time: 3 hours** **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

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### PART-A

1. (a) List the elements in FSM
   (b) Define regular language
   (c) Write the difference between moore and melay machine
   (d) Write the advantages of parse tree in identifying ambiguity
   (e) How to convert the grammar to Push down automata?
   (f) Define Turing Machine

**[2+2+2+2+2+2]**

### PART-B

**4 X 12 = 48**

2. (a) Explain the mathematical representation of FSM
   (b) Explain the advantages and disadvantages of FSM

3. (a) Find the language generated by context sensitive language G={V,T,P,S} where the production P={S->aSB|abc, bB->bbc,cB->Bc}
   (b) Explain the difference between CFL and CSL with example

4. (a) Design DFA to accept strings with 'c' and 'd' such that number of d's are divisible by 4.
   (b) Explain the procedure for constructing minimum state DFA with an example

5. (a) Explain about the Properties of Regular Expressions?
   (b) Construct Finite Automata for the regular Expression 1(01+10)*00?

6. (a) Explain how to eliminate the ambiguity from the grammar? Consider the example grammar from E->E+E/E-E/E*E, E->E/E , E->(E)/id
   (b) Construct the PDA for the given grammar S->AA|a, A->SA|b

7. (a) Construct a Turing Machine for language L = $\{ww^R \mid w \in \{0, 1\}\}$.
   (b) Explain in detail about P, NP, NP-complete and NP-hard problems

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