FUNDAMENTALS OF ENGINEERING

Mechanical

Practice Test 01

Instructions

Work Through This Test Carefully

This practice test is designed to help prepare for the Fundamentals of Engineering Mechanical exam.

The focus is on engineering fundamentals, technical understanding, and analytical thinking rather than calculation speed.

Each problem presents an independent engineering challenge and can be solved without reference to the other problems.

How to Use the QR Codes

Detailed solution videos are published on YouTube over time.

- **Printed version:** Scan the QR code to open the corresponding video.
- **Digital version:** Click the QR code to open the corresponding video.

The videos can be used both while working through the problems and for review afterward.

Watch Detailed Solutions on YouTube

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Contents

Questions

Question 1 – First-Order Differential Equations

Which of the following is the solution to the differential equation and initial condition shown below?

$$\frac{dT}{dt} + 4T = 0, \qquad T(0) = -2$$

a) $-2e^{-4t}$

b) $2e^{-4t}$

c) $-2e^{4t}$

d) $-4e^{-2t}$

Question 2 – Steady-State Heat Transfer Through a Plane Wall

A plane wall separates indoor air at 20 °C from outdoor air at 0 °C. The inside and outside convective heat transfer coefficients are 10 W / m^2K·and 25 W / m^2K, respectively. The wall has a thickness of 0.20 m and a thermal conductivity of 0.80 W/mK.

What is the steady-state heat flux through the wall?

a) 40.0 W/m^2

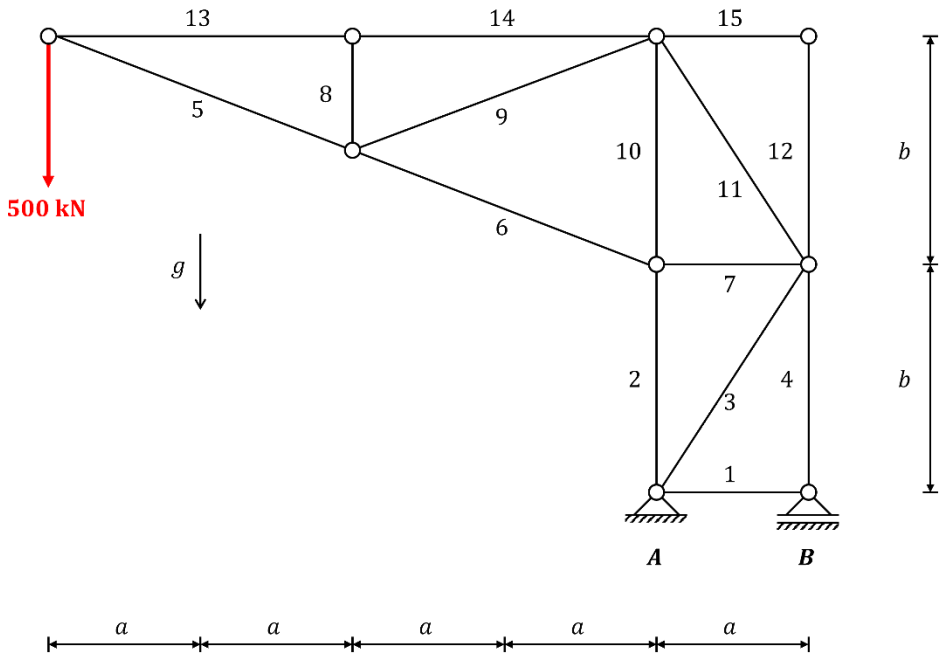
b) 51.3 W/m^2

c) 80.0 W/m^2

d) 142.9 W/m^2

Question 3 – Zero-Force Members in Trusses

Which of the following members are zero-force members in the truss shown?



a) 1, 8, 9, 12, 15

b) 1, 8, 12, 15

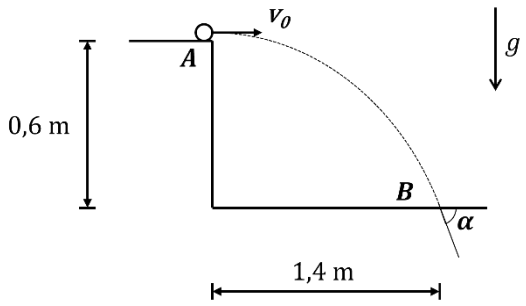
c) 1, 3, 8, 9, 12, 15

d) 1, 3, 8, 9, 11, 12, 15

Question 4 – Projectile Motion

A ball is projected horizontally from point A and lands at point B, as shown. Neglect air resistance.

Determine the impact angle α at point B.



a) 40.6°

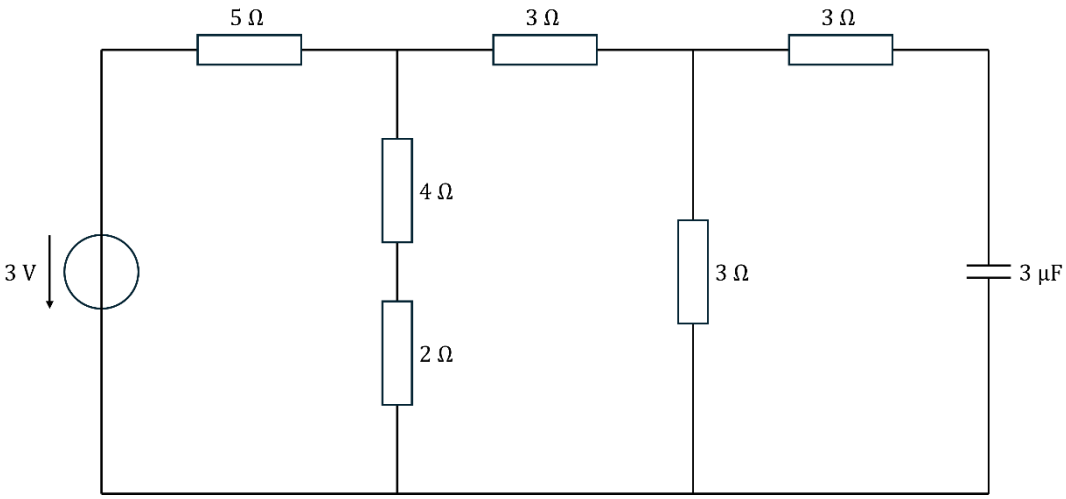
b) 23.2°

c) 49.4°

d) 59.0°

Question 5 – Steady-State DC Circuit Analysis

For the circuit shown, what is the steady-state current through the 5 Ω resistor?



a) 0.273 A

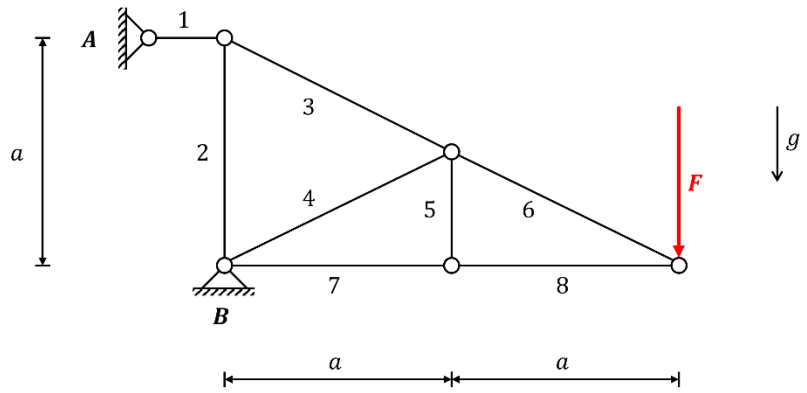
b) 0.375 A

c) 0.396 A

d) 0.625 A

Question 6 – Truss Support Reactions

Which of the following correctly represents the support reaction forces for the truss shown?



a) $F_A = F,\ F_B = \sqrt{2}F$

b) $F_A = F,\ F_B = \sqrt{5}F$

c) $F_A = 2F,\ F_B = 2F$

d) $F_A = 2F,\ F_B = \sqrt{5}F$

Answer Key

Question 1 – First-Order Differential Equations

a) $-2e^{-4t}$

Question 2 – Steady-State Heat Transfer Through a Plane Wall

b) $51.3\ \mathrm{W/m^2}$

Question 3 – Zero-Force Members in Trusses

c) $1, 3, 8, 9, 12, 15$

Question 4 – Projectile Motion

a) $40.6°$

Question 5 – Steady-State DC Circuit Analysis

b) $0.375\ \mathrm{A}$

Question 6 – Truss Support Reactions

d) $F_A = 2 \cdot F,\ F_B = \sqrt{5} \cdot F$

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