TS PGECET 2025 Question Paper With Solutions

Time Allowed :2 Hours	**Maximum Marks :**120	**Total questions :**120

General Instructions

Read the following instructions very carefully and strictly follow them:

1. **Mode of Examination:** Online (Computer-based examination)
2. **Medium of Exam:** English
3. **Duration of Exam:** 2 hours
4. **Type of Questions:** Multiple-choice questions
5. **Number of Questions:** 120 Questions
6. **Total Marks:** 120 Marks
7. **Marking Scheme:**
    - 1 mark for each correct answer.
    - No negative markings for incorrect answers.

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1. Find the residue of the function

$$f(z) = \frac{1}{z^2 + 1}$$

at the pole $z = i$.

(1) $\frac{1}{2}$

(2) $\frac{-1}{2}$

(3) 1

(4) $-\frac{1}{2}$

Correct Answer: (4) $-\frac{1}{2}$

Solution: The function has a simple pole at $z = i$. The residue at $z = i$ is given by:

$$\text{Res}(f, i) = \lim_{z \to i} (z - i) f(z)$$

Substituting into the function:

$$\text{Res}(f, i) = \lim_{z \to i} \frac{z - i}{z^2 + 1} = \lim_{z \to i} \frac{z - i}{(z - i)(z + i)} = \frac{1}{2i} = -\frac{1}{2}$$

Quick Tip

To calculate the residue at a simple pole, multiply the function by $(z - z_0)$ and take the limit as $z \to z_0$.

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2. What is the output of a NAND gate for the inputs A = 1, B = 1?

(1) 1

(2) 0

(3) 2

(4) Undefined

Correct Answer: (2) 0

Solution: The NAND gate output is the negation of the AND gate output. For inputs A = 1 and B = 1, the AND gate gives 1, and negating it gives 0.

Quick Tip

Remember that NAND = NOT(AND). If both inputs are 1, the output is always 0.

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3. The transfer function of a system is given by:

$$\frac{Y(s)}{X(s)} = \frac{10}{s^2 + 3s + 10}$$

What is the damping ratio of the system?

(1) 0.5

(2) 0.3

(3) 0.2

(4) 0.7

Correct Answer: (1) 0.5

Solution: The transfer function is in the form:

$$\frac{10}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

Comparing coefficients, $\omega_n^2 = 10$ and $2\zeta\omega_n = 3$. Thus, $\omega_n = \sqrt{10}$ and $\zeta = \frac{3}{2\sqrt{10}} \approx 0.5$.

Quick Tip

For a second-order system, the damping ratio ζ can be calculated from the coefficient of s and ω_n (natural frequency).

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4. The ultimate tensile strength of a material is 400 MPa. If the diameter of the wire is 10 mm, what is the maximum force that can be applied to the wire before it breaks?

(1) 3144 N

(2) 2827 N

(3) 314 N

(4) 282 N

Correct Answer: (1) 3144 N

Solution: The force is given by:

$$F = \sigma \times A$$

where σ is the ultimate tensile strength and A is the cross-sectional area. The area of a circular cross-section is:

$$A = \pi \left(\frac{d}{2}\right)^2 = \pi \left(\frac{10}{2}\right)^2 = 78.54\,\text{mm}^2$$

The force is:

$$F = 400 \times 78.54 = 3144\,\text{N}$$

Quick Tip

To calculate the maximum force, multiply the tensile strength by the cross-sectional area of the wire.

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5. Which of the following is not a type of process scheduling in operating systems?

(A) First-Come-First-Served (FCFS)

(B) Round Robin (RR)

(C) Shortest Job First (SJF)

(D) Longest Job First (LJF)

Correct Answer: (D) Longest Job First (LJF)

Solution: First-Come-First-Served, Round Robin, and Shortest Job First are common types of process scheduling algorithms, whereas Longest Job First (LJF) is not a standard process scheduling algorithm.

Quick Tip

Common process scheduling algorithms include FCFS, SJF, and RR. LJF is not widely used.

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6. The flow rate of a liquid through a pipe is 0.5 m³/s. What is the velocity of the fluid if the pipe has a diameter of 0.1 m?

(1) 5 m/s

(2) 10 m/s

(3) 15 m/s

(4) 20 m/s

Correct Answer: (1) 5 m/s

Solution: The flow rate Q is related to the velocity v and the cross-sectional area A by:

$$Q = A \times v$$

The area of the pipe is:

$$A = \pi \left(\frac{d}{2}\right)^2 = \pi \left(\frac{0.1}{2}\right)^2 = 7.85 \times 10^{-3}\,\text{m}^2$$

Thus,

$$v = \frac{Q}{A} = \frac{0.5}{7.85 \times 10^{-3}} \approx 5\,\text{m/s}$$

Quick Tip

To find the velocity of a fluid, divide the flow rate by the cross-sectional area of the pipe.

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7. The output voltage of a transistor amplifier is 12 V when the input is 2 V. What is the voltage gain of the amplifier?

(1) 6

(2) 5

(3) 4

(4) 3

Correct Answer: (1) 6

Solution: The voltage gain A_v is the ratio of the output voltage to the input voltage:

$$A_v = \frac{V_{\text{out}}}{V_{\text{in}}}$$

Substituting the values:

$$A_v = \frac{12}{2} = 6$$

Quick Tip

The voltage gain of an amplifier is simply the output voltage divided by the input voltage.

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8. What is the bandwidth of a signal if the highest frequency is 5 kHz and the lowest frequency is 2 kHz?

(1) 3 kHz

(2) 5 kHz

(3) 7 kHz

(4) 10 kHz

Correct Answer: (1) 3 kHz

Solution: The bandwidth B of a signal is the difference between the highest and lowest frequencies:

$$B = f_{\text{high}} - f_{\text{low}}$$

Substituting the values:

$$B = 5\,\text{kHz} - 2\,\text{kHz} = 3\,\text{kHz}$$

Quick Tip

The bandwidth of a signal is the difference between the highest and lowest frequencies present in the signal.

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9. Which of the following is a device used to connect multiple networks and operate at the network layer of the OSI model?

(A) Switch

(B) Router

(C) Hub

(D) Bridge

Correct Answer: (B) Router

Solution: A router is used to connect multiple networks and operate at the network layer (Layer 3) of the OSI model. It routes packets between different networks.

Quick Tip

Routers operate at Layer 3 of the OSI model and are used to connect different networks.

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10. What is the size of the address bus in a 16-bit microprocessor?

(1) 16 bits

(2) 8 bits

(3) 32 bits

(4) 64 bits

Correct Answer: (1) 16 bits

Solution: In a 16-bit microprocessor, the address bus is 16 bits wide, allowing it to address up to 2^{16} memory locations.

Quick Tip

The size of the address bus determines how much memory a microprocessor can address. In a 16-bit microprocessor, the address bus is 16 bits wide.
