Interesting Short-cuts:

Electrical Engineering:

1.Two identical inductors are connected in series twice. The first connection yields overall inductance of 380μH and the second connection yields an overall inductance of 240μH. What is the mutual inductance between inductors? (No options given)

Solution:

The first circuit connection is such that magnetic fields of inductors add to each other.

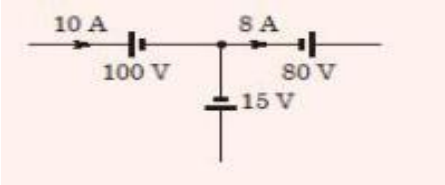
Hence, Total inductance = L+L +2M= 380

The first circuit connection is such that magnetic fields of inductors subtracts from each other.

Hence, Total inductance = L+L -2M= 240

Solving, we get M=35μH

2. Total power absorbed by the given circuit is: (No options given)



Solution:

Total power absorbed = 10 × 1000 – [(80 × 8) + (15 × 2)]

= 1000 – 640 – 30

∴ **Total Power absorbed = 330 W**

3. In a balance 3-phase system, 2 wattmeter method is used to measure the power. If reading of one wattmeter is twice of other, the load impedance angle (in radian) is:

(a) π/12 (b) π/8 (c) π/6 (d) π/3

Solution: (c)

From two wattmeter method,

$\tan \phi = \sqrt{3}.(W1 - W2)/(W1 + W_2)$

As W1 = 2W2 [Given]

∴ $\tan \phi = \sqrt{3}.(W2)/(3W_2)$

∴ **$\phi = \pi/6$ rad**

Mechanical Engineering:

1. In a power plant water is pumped from 80 kPa to 3 MPa. Isentropic efficiency of pump is 0.85. Temperature is kept constant. Find the specific work (kJ/kg) input for the pump.

(a) 0.34 (b) 2.48 (c) 2.92 (d) 3.43

Solution: (d)

Work input for compressor (theoretical) = –VΔP

= − 1/ρ(P2 − P1)= –2.92 kJ/kg

∴ **Actual work input = 2.92/ηc = 2.92/0.85 = 3.43 kJ/kg**

2. For a fully developed flow of water in a pipe of dia. = 10 cm, V = 0.1 m/s. Kinematic viscosity = 10^{-5} m_2/s. Find Darcy friction factor. (Numerical type, no option given).

Solution:

Re = VD/v= (0.1 X 0.1)/10^{-5} = 1000

∴ **Darcy friction factor (f) = 64/Re = 0.064**

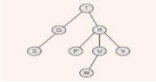
3. The damping ratio of single DOF spring mass damping system, with mass of 1 kg, stiffness = 100 N/m and viscous damping coefficient of 25 Ns/m is _____ (Numerical type, no option given).

Solution:

Damping ratio, ζ =C/Cc =C/2√km =25/(2√100) = 1.25

<u>Computer Science/Information Science Engineering:</u>

1. Find the inorder of the given tree:



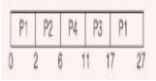
(a)SQTPWURV (b) SQTPRWUV (c) SQTPRUWV (d) SQTRPWUV

Solution: (a) Inorder traversal – left, node, right. Hence the answer is SQTPWUR

2. Calculate the average waiting time for the processes given below using SRTF algorithm:

Process	Arrival Time	Burst Time
P1	0	12
P2	2	4
P3	4	6
P4	6	5

Solution: The order of processes is as follows:



Waiting time for P1 = 17-2=15

Waiting time for P2 = 2-2=0

Waiting time for P3 = 11-4=7

Waiting time for P4 = 6-6=0

Average Waiting Time = (15+7)/ 4 = 5.5

3.What is the tightest upper bound of 2T(n/2) + logn?

(a) O (n) (b) O (n_2) (c) O(nlogn) (d) O($logn)_2$

Solution: (a) T(n)= 2T(n/2) + logn= O(n)

Electronics & Communication Engineering:

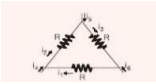
1. What is the fundamental period of the signal $\sin(\Pi_2 n)$?

(a) Π/2 (b) Π (c) 2/Π (d) non periodic

Solution: $\omega_0/2\Pi = K/N$

$N= 2\Pi/ \omega_0 = 2\Pi/ \Pi_2 = 2/\Pi$, which is irrational. Hence, the signal is non periodic.

2. In the given circuit, R= 1Ω, i_1= 2A, i_4= -1A and i_5= -4A. Then, which of the following is correct?



(a) i_6= 5A

(b) i_3= -4A

(c) The given distribution of currents is impossible

(d) data is insufficient

Solution: (a)

Using KCL:

$i_4 + i_1 + i_2 = 0$

$i_6 - i_1 + i_3 = 0$

$i_5 - i_3 + i_2 = 0$

Solving these, we get i_6= 5A.

3. The cut-off wavelength λc (μm) of light that can be used for intrinsic excitation of semiconductor having Eg(bandgap) = 1.12 eV is _____ (no options given)

Solution: $\lambda c = 1.24\mu m/Eg\ (eV)$

So, $\lambda c = 1.24/1.12 = 1.1071\mu m$