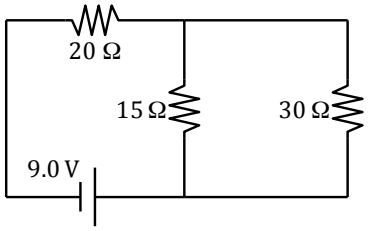
VERSION C:

PART I MULTIPLE CHOICE ANSWER ALL QUESTIONS IN SCANTRON SHEET (total 48%)

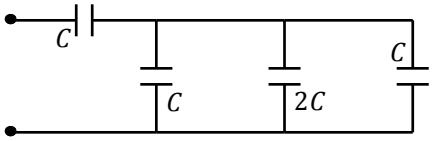
1 What is the current in A in the 20 Ω resistor?

a. 0.20
b. 0.30
c. 0.10
d. 0.26
e. none of the above



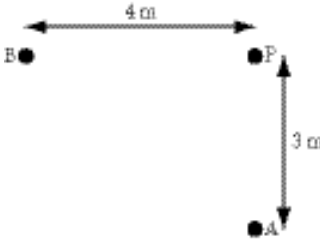
2 Determine the equivalent capacitance in pF for the network shown when C=20pF

a. 20
b. 16
c. 12
d. 24
e. 75



3 Three pendulums with strings of the same length and bobs of the same mass are pulled out to angles q_1, q_2 and q_3 respectively and released. The approximation sin $q = q$ holds for all three angles, with $q_3 > q_2 > q_1$. How do the angular frequencies of the three pendulums compare?

a) Need to know amplitudes to answer this question.
b) $w_1 = w_2 = w_3$
c) Need to know $\sqrt{g/L}$ to answer this question.
d) $w_1 > w_2 > w_3$
e) $w_3 > w_2 > w_1$



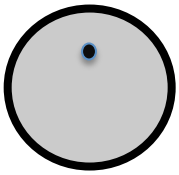
4 An observer stands 3 m from speaker A and 4 m from speaker B. Both speakers, oscillating in phase, produce 340 Hz waves. The speed of sound in air is 340 m/s. What is the phase difference (in radians) between the waves from A and B at the observer's location, point P?

a.0 b. $\frac{\pi}{2}$ c. π d. $\frac{3\pi}{2}$ e none of the above

5 A truck moving at 36 m/s passes a police car moving at 45 m/s in the opposite direction. If the frequency of the siren is 500 Hz relative to the police car, what is the change in frequency (in Hz) heard by an observer in the truck as the two vehicles pass each other? (The speed of sound in air is 343 m/s.)

a) 242 b) 238 c) 240 d) 236 e) 234

6 A disk (radius R = 1.5 m, mass = 2.0 kg) is suspended from a pivot a distance d = 0.25 m above its center of mass. The angular frequency (in rad/s) for small oscillations is approximately



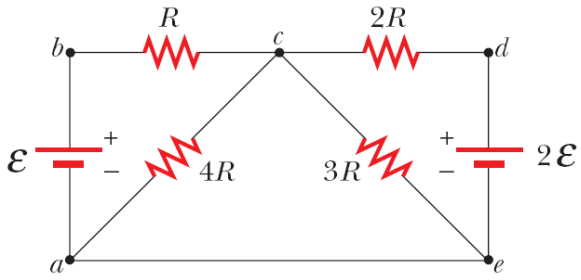
a) 4.2 b) 2.1 c) 1.3 d) 1.1 e)none of the above

7. A diver shines an underwater searchlight at the surface of a pond (n = 1.30). At what angle (relative to the surface) will the light be totally reflected?

a. 47° b. 41° c. 50° d. 58° e. 49°

VERSION A

PART II In examination booklet answer 4 out of 5 problems below:



1 Taking R = 2.00 kΩ and ε = 250 V in Figure , determine the direction and magnitude of the current between a and c. (13P)

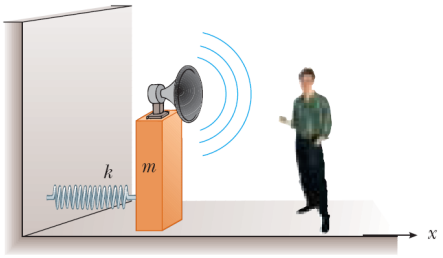
2 A 40.0-m length of coaxial cable has an thin (negligible thickness) conductor that has a diameter of 2.95 mm and carries a charge of 8.10μC. The surrounding thin (of negligible thickness) conductor has an diameter of 8.27 mm and a charge of –8.10 μC.

(a) What is the capacitance of this cable? (5P)

(b) What is the potential difference between the two conductors? Assume that the region between the cylinders is filled with the air (5P)

(c) The cable is stretched by factor of 2 what will be its new capacitance and potential difference? (3P)

3. A block with a speaker bolted to it is connected to a spring having spring constant k = 30.0 N/m as shown in. The total mass of the block and speaker is 8.00 kg, and the amplitude of this unit's motion is 0.700 m. The speaker emits sound waves of frequency 450 Hz. A)Determine the highest and lowest frequecies heard by the person standing 12 m to the right of the speaker. Assume that the speed of sound is 343 m/s.



B) Determine the highest and the lowest sound level (in dB) heard by the observer if the speaker's power is 10W

4 A particle of mass m slides without friction inside a hemispherical bowl of radius R. Show that if it starts from rest with a small displacement from equilibrium, the particle moves in simple harmonic motion with an angular frequency equal to that of a simple pendulum of length R (that is, $\omega = \sqrt{g/R}$).

5. A transparent cylinder of radius R = 2.00 m has a mirrored surface on its right half, as shown. A light ray traveling in air is incident on the left side of the cylinder. The incident light ray and exiting light ray are parallel and d = 1.50 m. Determine the index of refraction of the material.