GE1354 – Introduction to Electronic Design

2020-2021 Sem B

Test 1

Section 1   Multiple choice questions:

Q1a Which of the following statement/statements is/are NOT CORRECT?
     (a)   Water ripple generated on the surface of water belongs to a mechanical wave
     (b)   Wireless signal received by a radio receiver belongs to a mechanical wave
     (c)   Terahertz wave belongs to a longitudinal wave
     (d)   Sound generated from a loudspeaker belongs to a longitudinal wave

Ans: (b) and (c)

Q1b Which of the following statement/statements is/are NOT CORRECT?

     (a)   The wave generated by a microwave oven belongs to a mechanical wave
     (b)   Sound heard from a television belongs to a mechanical wave
     (c)   Terahertz wave belongs to a transverse wave
     (d)   Sound generated from a guitar belongs to a transverse wave

Ans: (a) and (d)

Q2a Which of the following statement/statements is/are CORRECT?

     (a)   The speed of sound is different in different materials
     (b)   The speed of sound in a medium is directly proportional to its frequency
     (c)   The frequency of a sound is proportional to its wavelength
     (d)   The velocity of sound in water is proportional to the water temperature

Ans: (a) and (d)

Q2b Which of the following statement/statements is/are CORRECT?

     (a)   The velocity of sound traveling in a solid medium, in general, is faster than in a
              liquid medium or in a gaseous medium
     (b)   The speed of sound in the liquid is inversely proportional to its frequency
     (c)   The products of the frequency and the wavelength of a sound wave is constant
     (d)   The velocity of sound in vacuum is slower than in the gaseous medium

Ans: (a) and (c)

Q3a A car horn generating a tone $f_s = 1000$ Hz moves towards a stationary observer at a speed of $v_s = 20$ m/s. What is the frequency f_0 (Hz) being heard by the observer? You may assume the velocity of sound in air is $v_a = 340$ m/s.

    (a)   1125.0 Hz
    (b)   1062.5 Hz
    (c)   1058.8 Hz
    (d)   944.4 Hz

Ans: $f_0 = f_s * v_a/(v_a - v_s) = (1000)(340)/(340 - 20) = 1062.5$ Hz

Q3b A car horn generating a tone $f_s = 800$Hz moves away from a stationary observer at a speed of $v_s = 15$ m/s. What is the frequency f_0 (Hz) being heard by the observer? You may assume the velocity of sound in air is $v_a = 340$ m/s.

    (a)   836.9 Hz
    (b)   835.3 Hz
    (c)   766.2 Hz
    (d)   764.7 Hz

Ans: $f_0 = f_s * v_a/(v_a + v_s) = (800)(340)/(340 + 15) = 766.2$ Hz

Q4a In the python language, the command "For" belongs to which type of the following programming structures?

(a) Sequence
(b) Selection
(c) Iteration
(d) None of the above

Ans: (c)

Q4b In the python language, the command "button_b.is_pressed()" belongs to which type of programming structures?

(a) Sequence
(b) Selection
(c) Iteration
(d) None of the above

Ans: (b)

Q5a What is the beat frequency f_B produced by the superposition of 10.5 kHz and 10.0 kHz sound waves with the same amplitude?

(a) 0.5 kHz
(b) 1.05 kHz
(c) 20.5 kHz
(d) 105 kHz
(e) none of the above

Ans: $f_B = 10.5 - 10.0 = 0.5$ kHz (a)

Q5b What is the beat frequency f_B produced by the superposition of 320 Hz and 300 Hz sound waves with the same amplitude?

    (a) 1.07 Hz
    (b) 20 Hz
    (c) 620 Hz
    (d) 96K Hz
    (e) none of the above

Ans: $f_B = 320 - 300 = 20$ Hz (b)

Q6a Which of the following is the basic principle of an active noise-canceling headphone?

    (a) Superposition
    (b) Dopper Effect
    (c) Frequency Beating
    (d) Binaural Beat
    (e) None of the above

Ans: (a)

Q6b Which of the following is the basic principle of Sonic Bomb?

    (a) Superposition
    (b) Dopper Effect
    (c) Frequency Beating
    (d) Binaural Beat
    (e) None of the above

Ans: (b)

Q7a Calculate the acoustic power P transmitted through a cross-sectional area of 10 m^2 if its sound intensity is 70dB above a reference power of 10^{-10} W/m^2.

    (a) 0.1 mW
    (b) 1 mW
    (c) 10 mW
    (d) 100 mW
    (e) None of the above

Ans: $P = 10^{-10} * 10^7 * 10 = 10$ mW. Ans: (c)

Q7b Calculate the acoustic power P transmitted through a cross-sectional area of 1 m² if its sound intensity is 60dB above a reference power of 10^{-10} W/m².

    (a) 0.1 mW
    (b) 1 mW
    (c) 10 mW
    (d) 100 mW
    (e) None of the above

Ans: $P = 10^{-10} * 10^6 * 1 = 0.1$ mW. Ans: (a)

Q8a If the frequency of a musical note A is 111.00 Hz, what is the frequency of musical note D#?

    (a) 148.17 Hz
    (b) 155.56 Hz
    (c) 156.98 Hz
    (d) 166.31 Hz
    (e) None of the above

Ans: $f_C = (111.00)*2^{\wedge}(6/12) = 156.98$ Hz

Q8b If the frequency of a musical note A is 439.00 Hz, what is the frequency of musical note B?

    (a) 465.10 Hz
    (b) 492.76 Hz
    (c) 493.92 Hz
    (d) 522.06 Hz

Ans: $f_C = (439.00)*2^{\wedge}(1/12) = 492.76$ Hz

Section 2   Long questions

Question 9(a)

Refer to the python program shown below, answer the following questions.

```python
1  TEMP = "N"
2  while(True):
3      TEMP = input("Type C or D>>")
4      if(TEMP == "C"):
5          print("HAPPY")
6      else:
7          if(TEMP == "E"):
8              print("SAD")
```

1) What will happen when a "C" is inputted at line 3? (2 marks)
2) What will happen when a "D" is inputted at line 3? (2 marks)
3) The commands in lines 4 and 6 belong to which type of programming structure? (1 mark)
4) Which type of variable "TEMP" is? (1 mark)
5) Discuss if there will any impact to the program logic if line 1 is changed to TEMP = "Y" (2 marks)

Ans:
1) The MU console will display "HAPPY", then the program will display ("Type C or D>>") and wait for another input.
2) The program will not display neither "HAPPY" nor "SAD". It will only show ("Type C or D>>") and wait for another input.
3) Commands "if" and "else" belong to the "selection" structure.
4) Variable "TEMP" belongs to type "string"
5) No matter the value of set for the variable "TEMP" in line 1, its value will be overridden by line 3. As a result, the change will not have any impact on the program logic.

Question 9(b)

Refer to the python program shown below, answer the following questions.

```python
1  TEMP = "N"
2  while(True):
3      TEMP = input("Type C or D>>")
4      if(TEMP == "C"):
5          print("HAPPY")
6      else:
7          if(TEMP == "E"):
8              print("SAD")
```

1) What will happen when an "E" is inputted at line 3? (2 marks)
2) What will happen when a "D" is inputted at line 3? (1 marks)
3) The commands in line 2 belong to which type of programming structure? (1 mark)
4) Which type of the constant "True" in line 2 is? (1 mark)
5) Discuss if there will any impact to the program logic if line 1 is changed to TEMP = "E" (2 marks)

Ans:
1) The MU console will display "SAD", then the program will display ("Type C or D>>") and wait for another input.
2) The program will not display neither "HAPPY" nor "SAD". It will only show ("Type C or D>>") and wait for another input.
3) Commands "while" belong to the "iteration" structure.
4) Constant "True" belongs to type "Boolean"
5) No matter the value of set for the variable "TEMP" in line 1, its value will be overridden by line 3. As a result, the change will not have any impact on the program logic.