Date: 19-Jan-2020
Written test: 70 marks
Answer all the twenty (20) questions below. Choose the correct answer. Each question carries equal marks.

1. A resistor in the lab has colour marking of white-violet-black from left to right. The value of the resistance is
   [A] 6.7 Ohm
   [B] 9.7 kOhm
   [C] 97 Ohm
   [D] 67 Ohm

2. A ceramic capacitor has "103 500V" written on it. The value of the capacitance is
   [A] 10 mF
   [B] 0.1 mF
   [C] 1 µF
   [D] 0.01 µF

3. A single phase lagging load is connected to a single phase supply. The current and voltage are related as
   [A] Load current lags load voltage
   [B] Load voltage lags load current
   [C] Line voltage lags load voltage
   [D] Line current lags load current

4. A single phase 230V source is connected to a resistive load of 23 ohms. The power dissipated in the load is
   [A] 23 W
   [B] 5290 W
   [C] 2300 W
   [D] 230 W

5. An AC coupled measurement with an oscilloscope loses the following information present in the input voltage waveform:
   [A] Low frequency components
   [B] High frequency components
   [C] There is no loss of any information
   [D] Intermediate frequencies determined by the bandwidth
6. In an oscilloscope with 1 MOhm input impedance, what is the usual gain of a 10x probe?
   [A] $\frac{1}{2}$
   [B] $\frac{1}{5}$
   [C] 1/50
   [D] 1/10

7. The value of the current $i$ in the following circuit is

   ![Circuit Diagram]

   [A] 2 A
   [B] 0.4 A
   [C] -0.4 A
   [D] -2 A

8. An RC circuit has $R = 200$ Ohm and $C = 10$ mF. The time constant of the circuit is
   [A] 2 s
   [B] 4 s
   [C] 0.25 s
   [D] 0.5 s

9. The frequency of the waveform (shown below) obtained from an oscilloscope, is

   ![Waveform Diagram]

   [A] 100 kHz
   [B] 50 kHz
   [C] 25 kHz
   [D] 10 kHz

10. The peak-to-peak voltage recorded in the waveform shown in Q9 is:
    [A] 2 volts
    [B] 4 volts
    [C] 0.4 volts
    [D] 1 volt
11. The RLC circuit response shown in the following diagram is a/an

![Diagram of RLC circuit response]

[A] overdamped response.  
[B] critically damped response  
[C] underdamped response  
[D] none of the above.

12. Consider a series RLC circuit with $R = 10$ ohm, $L = 1$ mH and $C = 1$ μF. This is connected across a 10 V DC battery. How much current flows through the circuit at steady state?

[A] 1A  
[B] 1 mA  
[C] 1/3 mA  
[D] Zero

13. It is required to start a separately excited 220 V DC motor in the lab. Which of the following statements is true?

[A] The field circuit resistance should be high and the armature circuit resistance high  
[B] The field circuit resistance should be low and the armature circuit resistance high  
[C] The field circuit resistance should be high and the armature circuit resistance low  
[D] The field circuit resistance should be low and the armature circuit resistance low

14. Which loss is determined by short circuit test of a transformer?

[A] Core loss  
[B] Eddy current loss  
[C] Hysteresis loss  
[D] Copper loss

15. A 220 V, 10 A DC generator needs to be loaded by using loading rheostats. Which of the following rheostats available in the lab can be chosen?

[A] 5 ohm, 5 A  
[B] 10 ohm, 12 A  
[C] 50 ohm, 5 A  
[D] 50 ohm, 12 A
16. A constant DC voltage of magnitude 100V is applied for a long time to the input of a 2:1, 100V, 1kW transformer with 10 ohm connected at the secondary. Which of the following statements is true at steady state?
   [A] The primary current would be enormously high.  
   [B] The primary current would be 15 A.  
   [C] The primary current would be 10 A.  
   [D] The primary current would be 0 A.

17. An Operational Amplifier has
   [A] High Output Impedance and Low Input Impedance  
   [B] High Input Impedance and Low Output Impedance  
   [C] High Output Impedance and High Input Impedance  
   [D] Low Input Impedance and Low Output Impedance

18. For the Operational Amplifier circuit shown, what is the output voltage $V_{out}$ magnitude?  
   Given: $V_{in} = 5V$, $R_i = 30$ kohm, $R_f = 10$ kohm, $+V_{cc} = 12V$, $-V_{cc} = -12V$.

   ![Operational Amplifier Circuit Diagram]

   [A] 15V  
   [B] -15V  
   [C] 12V  
   [D] -12V

19. A diode in series with a load resistance and excited by a sinusoidal source, functions as
   [A] an inverting amplifier  
   [B] a non-inverting amplifier  
   [C] a half-wave rectifier  
   [D] a full-wave rectifier

20. Let $X$ and $Y$ are the two inputs of an Exclusive-OR gate. The output of this gate is 1 if
   [A] $X = 1$, $Y = 0$  
   [B] $X = 0$, $Y = 0$  
   [C] $X = 1$, $Y = 1$  
   [D] None of the above