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**University Examinations 2016/2017**

 THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE PHYSICS AND BACHELOR OF EDUCATION SCIENCE

**SPH 3303: ELECTRONICS I**

**DATE: December, 2016 TIME: HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE - (30 MARKS)**

1. State the three types of classifications of vacuum tubes. (3 Marks)
2. Determine the amplification factor of a trade valve if its plate resistance is 20,000𝛺 and the mutual conductance is 3mA/volt. (3 Marks)
3. Define the following terms as used in electronics. (5 Marks)
4. Insulators
5. Conductors
6. Semi-conductors
7. Diodes
8. Transistors
9. Over what range of input voltage will the zener regulating circuit given below maintain 30 volts across the 2000 ohms resistor? Given that the maximum zener current is 25mA and the source resistance Rs = 200 ohms. (5 Marks)
10. State the three basic characteristic of an operational amplifier. (3 Marks)
11. With the help of diagrams, distinguish between inverting and non-inverting operational amplifier configurations. (4 Marks)
12. State two advantages and two disadvantages of a common-base (CB) transistor amplifier

(4 Marks)

1. Define the following terms; (3 Marks)
2. Transistor leakage current
3. P-type semiconductor
4. Dapletion region

**QUESTION TWO (20 MARKS)**

1. Discuss the characteristics (forward and Reverse) of a semiconductor diode. (8 Marks)
2. A silicon diode for which the reverse saturation current is 10A is conducting 1 ampere at 300k. Determine the forward voltage drop across it.

 (Take K= 1.38 x , x (5 Marks)

1. A 10V zener diode along with a series resistance is connected across a 40V supply. Calculate the minimum value of the resistance required, if the maximum zener current is 50mA. (3 Marks)
2. A stabilized voltage of 12V across a load whose current varies from 5mA to 35mA with an unregulated d.c. supply of 18V is to be obtained with a zener diode of zener voltage 12V and . Calculate the value of the current limiting resistance required for the same and the power dissipated in the resistance. (4 Marks)

**QUESTION THREE (20 MARKS)**

1. Transistors can be used as amplifiers. Justify this statement by discussing with aid of diagrams the three basic circuits for transistor amplifiers. (15 Marks)
2. A transistor is connected in CE configuration. The voltage drop across 5k𝛺 resistance which is connected in the collector circuit is 5V. If of the transistor is 0.998, calculate the base current. (5 Marks)

**QUESTION FOUR (20 MARKS)**

1. Sketch the operational amplifier connected as an integrator. (3 Marks)
2. In the circuit below, at time t=0 the capacitor is uncharged and the output voltage (Vout) is +14V. At a later time the voltmeter connected to the output shows that Vout has changed to -14V. Calculate the time at which Vout changes from +14V to -14v.

(8 Marks)

1. Sketch and explain the operation of the bridge rectifier. (9 Marks)