

DO NOT WRITE ANYTHING ON QUESTION PAPER EXCEPT YOUR NAME, DEPARTMENT AND ENROLMENT No.

POSSESSION OF MOBILE, SMART WATCH ETC. IN EXAMINATION IS A UFM PRACTICE

Name of Student ----- Enrolment No. -----

Department / School -----

**BENNETT UNIVERSITY, GREATER NOIDA**

**Supplementary Examination, July 2019**

COURSE CODE: **EECE105L**

MAX. DURATION: **Three Hours**

COURSE NAME: **Fundamentals of Electrical and Electronics Engineering**

COURSE CREDIT: **5 Credits**

MAX. MARKS: **100**

**Note :**

- The student is allowed to use non-programmable scientific calculators.
- Answer all questions.
- The marks allocated to each question are indicated in brackets.

### Questions

1. Determine whether the Boolean equation Eq. (1) is true or false. **(10 Marks)**

$$\overline{xy} + \overline{xz} + \overline{yz} = \overline{zx} + \overline{yz} + \overline{xz} \quad \text{Eq. (1)}$$

2. Implement a two-input XNOR gate using NAND gates. **(10 Marks)**
3. For the truth table given below, derive and simplify the standard SOP and POS forms. **(10 Marks)**

| A | B | C | Y |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

4. An input voltage signal  $V = 10 \sin(\omega t)$  is applied to a bridge rectifier circuit. Answer the following questions. **(10 Marks)**
- Draw the bridge rectifier circuit. **(5 Marks)**
  - If the load is 1 k $\Omega$ , draw the output current waveform. **(5 Marks)**

5. Consider the circuit shown in Fig. 1. The output is taken between nodes A and B. The transfer function is Answer the following questions. **(10 Marks)**
- Find the transfer function. **(3 Marks)**
  - Find the cut-off frequency of the filter. **(3 Marks)**
  - Evaluate the transfer function at an input frequency of 100 kHz. **(2 Marks)**
  - Identify the filter type and draw the transfer function. **(2 Marks)**

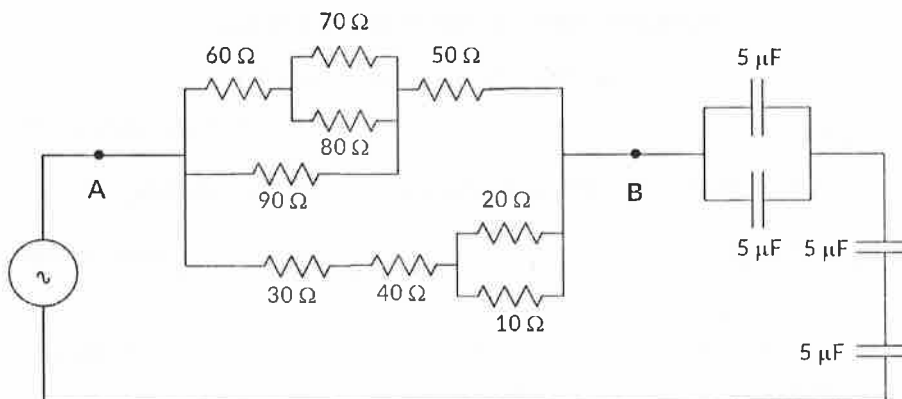


Fig. 1: Circuit for problem 5

6. What is the power dissipated by the 4Ω resistor in the circuit shown in fig. 2. **(10 Marks)**

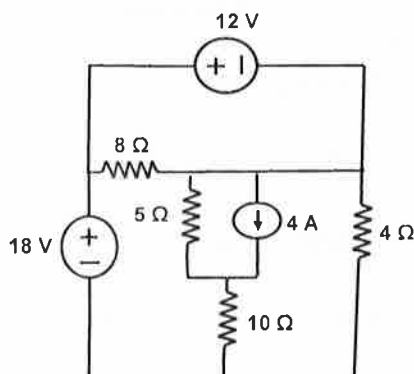


Fig. 2: Circuit for problem 6

7. Find the equivalent capacitance between points A and B in the circuit shown in fig. 3. Assume each capacitance is 1 μF. **(5 Marks)**

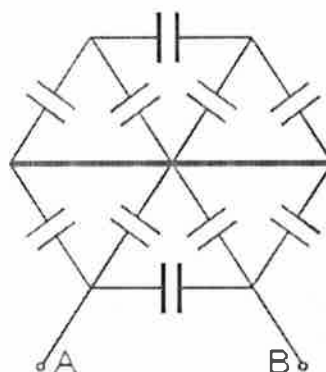


Fig. 3: Circuit for problem 7

8. The voltage across a diode is 0.65 V. Given that  $I_0 = 10^{-11}$  A and  $\eta = 2$ . Answer the following questions. **(8 Marks)**
- Find the current through the diode. **(2 Mark)**
  - Find the DC resistance of the diode. **(2 Mark)**
  - Find the ac resistance of the diode. **(2 Marks)**
  - If the diode voltage changes from 0.65 V to 0.6 V, Find the average AC resistance of a diode. **(2 Marks)**
9. In a piece of silicon, the energy difference between the conduction band and the Fermi level is 0.8 eV. Answer the following questions. Given that the band gap of silicon is 1.1 eV, the intrinsic carrier concentration is  $10^{10} \text{ cm}^{-3}$ . **(8 Marks)**
- Draw the thermal equilibrium energy band diagram. **(2 Mark)**
  - What is the doping type? **(2 Mark)**
  - Which type of carriers are majority carriers, and which type of carriers are majority carriers? **(2 Mark)**
  - What is the conductivity of the sample? **(2 Mark)**
10. Draw the cross-section diagram of an n-channel MOSFET. Explain the working of an n-channel MOSFET and draw its output characteristics. Limit the answer to 60 words. **(5 Marks)**
11. In the circuit shown in Fig. 4, If  $v(t)$  and  $i(t)$  are in phase, what is the value of  $L$ ? Given that  $\omega = 4000 \text{ rad/sec}$ . **(6 Marks)**

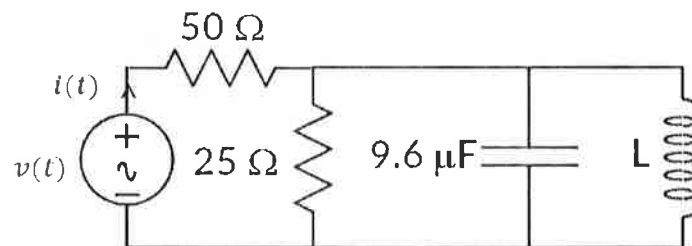


Fig. 4: Circuit for problem 11

12. Convert  $100.428_{(10)}$  to binary. After the radix point, six positions are desired. **(4 Marks)**  
Radix point: or radix character is the symbol used in numerical representations to separate the integer part of a number from its fractional part.
13. Represent -37 in sign-bit (sign modulus) representation, 1's complement and 2's complement. Use 8-bits. **(4 Marks)**

----- END OF QUESTION PAPER -----

