

**B. MECHANICAL ENGINEERING FIRST YEAR FIRST SEMESTER SUPPLEMENTARY
EXAMINATION 2017**

Subject: ELECTRONICS

Time: Three Hours

Full Marks: 100

Answer any **FIVE** questions
(Questions must be answered serially and
All parts of the same question must be answered at one place only)

1. (a) Define the performance metrics of a rectifier circuit and derive their expressions.
(b) A vacuum diode, the forward resistance of which is 400 ohm, supplies power of a load resistance 1200 ohm from a 230 V (rms) mains. Calculate (i) the dc load current, (ii) the ac load current, (iii) the dc voltage across the diode, and (iv) the dc output power. 12 + 8

2. (a) Explain the mechanism of current flow in a biased n- type and p-type semiconductors.
(b) Write down the I-V relation of a p-n junction diode. Explain each term. 12+8

3. (a) Explain the action of self-biasing in a BJT amplifier circuit.
(b) Discuss how a transistor can be used as a current amplifier. 10+10

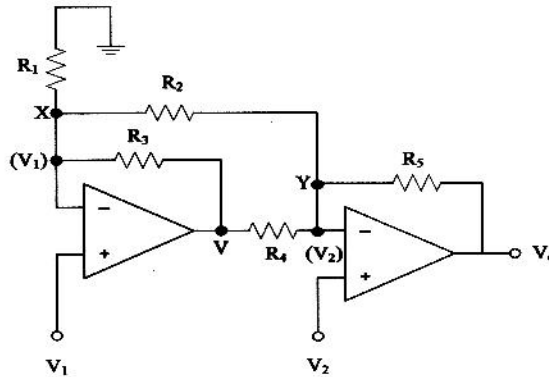
4. (a) With a neat sketch , describe the construction of an n-channel JFET.
Explain its principle of operation.
(b) Compare between a FET and a BJT 12+8

5. (a) What are the different h-parameters associated with CE transistor?
(b) Derive the expressions for current gain and input impedance of CE transistor amplifier. 8 + 12

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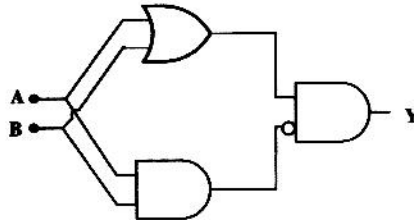
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6. (a) State the characteristics of an ideal OPAMP. Draw an adder circuit using OPAMP and explain its action.
- (b) In the following circuit $R_1 = R_3 = R_4 = R_5 = 10k\Omega$ and $R_2 = 100\Omega$. Find the differential mode gain $A = \frac{V_0}{V_1 - V_2}$.



10+10

7. (a) Write the Boolean expression for the output Y and find the truth table. Hence identify the gate.



- (b) How can NOT operation be implemented using a XOR gate?
- (c) Draw a logic circuit using NOR gates to implement the Boolean expression $AB + \overline{BC}$.
6+6+8
8. (a) Prove the identities:
- $\overline{ABC} + \overline{A\overline{B}C} + \overline{AB\overline{C}} + \overline{ABC} = \overline{BC} + \overline{AC}$
 - $(A \oplus B) \oplus C = A \oplus (B \oplus C)$
- (b) What are the basic laws of Boolean Algebra. 12+8