

Roll No. ....

# TEC-101

## B. TECH. (FIRST SEMESTER) END SEMESTER EXAMINATION, 2018

(All Branches)

### BASIC ELECTRONICS ENGINEERING

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

#### Section—A

1. Fill in the blanks : (1×5=5 Marks)

- (a) Valence band and Conduction band are overlapped in .....
- (b) Ripple factor of half wave rectifier is .....
- (c) In normal case transistor works in ..... region.
- (d) Input impedance of an ideal op-amp. is .....
- (e)  $(356)_8 = (.....)_H$ .



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2. Attempt any *five* parts out of seven :

(3×5=15 Marks)

(a) Which is the most commonly used semiconductor material and why ?

(b) What is the difference between Avalanche and Zener breakdown ?

(c) Derive the relationship between  $\alpha$  and  $\beta$  for BJT.

(d) Write the characteristics of an ideal op-amp.

(e) If  $(146)_x + (152)_x + (331)_x$ , find the value of  $x = ?$ (f) A half wave rectifier is used to supply 50 V d. c. to a resistive load of 800  $\Omega$ . The diode has a resistance of 25  $\Omega$ . Calculate required a. c. voltage.

(g) Design an Adder circuit using an op-amp. to get the output expression as :

$$V_{\text{out}} = -(V_1 + 10 V_2 + 100 V_3)$$

where  $V_1$ ,  $V_2$  and  $V_3$  are the inputs. Given that  $R_f = 100 \text{ k}\Omega$ .

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## Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) What is depletion region ? Explain, how the depletion layer prevents the flow of carriers across the PN junction with diagram ?

(b) What is mobility and conductivity ? Derive the equations for mobility and conductivity.

(c) A regulator circuit uses Zener diode of 30 V, series resistance ( $R_s$ ) is 3  $\text{k}\Omega$ . If the input voltage is 60 V, find the Zener current ( $I_Z$ ) when load resistance ( $R_L$ ) is :(i) 30  $\text{k}\Omega$ (ii) 10  $\text{k}\Omega$ (iii) 5  $\text{k}\Omega$ 4. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)(a) Explain the working of half wave rectifier. Derive the equations for d. c. output current ( $I_{DC}$ ) and d. c. output voltage ( $V_{DC}$ ).(b) What is the need of filter circuits in regulated power supply ? Explain inductor, capacitor and  $\pi$  filters.



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(c) A full-wave rectifier uses a double diode with each element having a constant forward resistance of  $500 \Omega$ . The transformer r. m. s. secondary voltage from the centre tap to each plate is 300 V, the load resistance of  $2.5 k \Omega$ . Determine :

(i) d. c. out power ( $P_{dc}$ ) and a. c. input power ( $P_{ac}$ ).

(ii) Efficiency ( $\eta$ ).

5. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Explain the working of basic transistor operation in CB configuration. Draw the input and output characteristics of CB configuration of *npn* transistor.

(b) What is bias stabilization ? Derive the general expression for stability factor.

(c) Derive the expression for op-amp. as a differentiator and as an integrator.

6. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) What do you understand by universal gates ? Draw the symbol and write the truth table of universal gates. Realize logic circuit of EXOR gate using NAND gate.

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(b) Simplify the given Boolean expression and realize the simplified expression by basic gates :

$$F = A\bar{B} + ABC + A(B + A\bar{B})$$

(c) Solve the following expression using K-Map and realize the reduced expression by basic gates :

$$F(A, B, C, D) = \sum m(5, 8, 9, 10, 11, 14, 15) + \sum d(0, 7, 13)$$

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