

Ex/ME/ET/T/113/2019 (Old)

B.E. MECHANICAL ENGINEERING (Old) - 2019

FIRST YEAR FIRST SEMESTER

ELECTRONICS

Time: 3 hr

Full Marks: 100

Answer any five (5) questions

- (a) What is an ideal diode? How it can be represented as a switch? Draw the equivalent circuit and its characteristics.

(b) Draw the circuit of a full-wave bridge rectifier and explain its working principle with neat waveforms. What is Ripple factor?

(c) What is meant by filter? Which filter has a current smoothing action? Draw a neat sketch of a simple capacitor filter for a half-wave rectifier and explain its working principle with proper waveform.

(1+5)+ (6+1) + (1+1+5) =20

- (a) If a transistor has its collector-base junction forward biased and the other junction reverse biased, will it work? Explain.

(b) Explain the following regions in a transistor (CE mode): i) Active, ii) Saturation, iii) Cut-off.

(c) The collector current of a transistor is 100 mA and β is 75. Calculate the value of base current and emitter current.

(d) In CE configuration collector supply voltage $V_{cc} = 10V$, load resistance R_c is $8K\Omega$. Draw DC load line. What do you mean by operating point?

(5)+ (2+2+2) + (2+2) + (3+2) =20

- (a) Explain the four distinct regions of the output characteristics of JFET.

(b) A FET has a drain current of 4 mA. If $I_{DSS} = 6$ mA and $V_{GS(off)} = -6$ V. Find the values of V_{GS} and V_p .

(c) Distinguish between JFET and MOSFET. What is meant by gate-to- source threshold voltage in E-MOSFET? How does FET behave for small values of $|V_{DS}|$ and for large values of $|V_{DS}|$?

(d) "FET can be used as a voltage variable resistance" Define it.

(5)+ (5) + (3+1+2) + (4) = 20

4. (a) What is feedback in amplifier? Define degenerative and regenerative feedback? Mention the advantages of negative feedback amplifier.
 (b) Barkhausen condition is required in order for sinusoidal oscillation to be sustained. – Explain.
 (c) An amplifier has a voltage gain of 200. The gain is reduced to 50 when negative feedback is applied. Determine feedback factor β and express the amount of feedback in dB.
 (d) “The stability of the amplifier is improved due to reduction of gain.” Prove it. In an oscillator which feedback is used?

$$(1+3+2) + (3) + (5) + (5+1) = 20$$

5

- (a) Explain the operation of Single bit full adder with proper Truth table and K map.
 (b) Explain the operation of four bit parallel full adder. How it is different with serial adder?
 (c) State and prove Associative and Distributive theorems.

$$8+6+6=20$$

6

- (a) Design a BCD to Excess – 3 converters with minimum number of logic gates.
 (b) Design a single bit comparator.
 (c) Minimize the equation using K map

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

$$10+3+7=20$$

7

- (a) Explain the operation of symmetric but non weighted code and weighted code.
 (b) Express the following equation in POS form

$$F = xy + \bar{x}z, Y = AB + ACD$$

- (c) Obtain the canonical product of the sum expression o

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

- (d) Minimize the following equation

$$X = \overline{[(\overline{AB}) \cdot A]} \cdot \overline{[(\overline{AB}) \cdot B]}$$

$$8+4+4+4=20$$

8

- (a) Explain the operation of Multiplexer Tree using multiplexer only.
 (b) Design a full adder using a 4x1 MUX. Choose B as select line and use two separate MUX for Sum and Carry.
 (c) What is duality principle?

$$8+8+4=20$$