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14ELN15/25

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Electronics

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting ONE full question from each module.***

Module – 1

1 a. Explain the operation of a full wave rectifier using centre tap transformer with the help of a circuit diagram and relevant waveforms. Show that its maximum efficiency is 81.2%. **(10 Marks)**

b. Draw the common emitter circuit of a transistor and sketch the input and output characteristics. Explain the different regions of operation by indicating them on the characteristic curve. **(07 Marks)**

c. Calculate I_C, I_E and β in a common emitter transistor circuit that has $\alpha = 0.98$ and $I_B = 100\,\mu A$. **(03 Marks)**

2 a. With appropriate circuit diagram, explain the DC load line analysis of a semiconductor diode. **(05 Marks)**

b. Explain the working of a negative clamper circuit. **(05 Marks)**

c. A transformer with 10 : 1 turns ratio is connected to a halfwave rectifier with supply voltage of $220\sin 210t$. If load and forward resistances are 500 Ω and 10 Ω respectively, calculate the average output voltage, dc output power, ac input power, rectification efficiency and peak inverse voltage. **(05 Marks)**

d. With neat circuit diagrams, explain zener voltage regulator with load and no load. **(05 Marks)**

Module – 2

3 a. In a voltage divider bias circuit, $V_{CC} = 24V$, $R_1 = 180\,K\Omega$, $R_2 = 56\,K\Omega$, $R_E = 4.7\,K\Omega$ and $R_C = 8.2\,K\Omega$. Calculate the approximate levels of I_C, V_E, V_C and V_{CE}. **(05 Marks)**

b. Explain how an opamp can be used as a, (i) Voltage follower , (ii) Integrator (iii) Differentiator and (iv) Summing amplifier. **(10 Marks)**

c. Design an inverting and non inverting operational amplifier to have a gain of 15. **(05 Marks)**

4 a. What is an operational amplifier? List the ideal characteristics of an opamp. **(06 Marks)**

b. The base bias circuit has $R_B = 470\,K\Omega$, $R_C = 2.2\,K\Omega$, $V_{CC} = 18\,V$ and if the transistor has $\beta = 100$. Determine I_B, I_C and V_{CE}. **(06 Marks)**

c. Design an adder circuit using an opamp to obtain an output voltage of, $V_0 = -[2V_1 + 3V_2 + 5V_3]$ **(05 Marks)**

d. Explain slew rate and CMRR of an opamp. **(03 Marks)**

Module – 3

5 a. Realize a two input exclusive NOR gate using only NAND gates, indicating the output at each of the gate. **(04 Marks)**

b. Realize a Full adder using two half adders and an OR gate. Write the truth table and expressions for sum and carry outputs. **(08 Marks)**

c. State and prove DeMorgan's theorem. **(04 Marks)**

d. Simplify the Boolean expression, $\overline{\overline{xy + xyz} + x(y + x\bar{y})}$. **(04 Marks)**

6 a. Subtract $(1111.101)_2$ from $(1001.101)_2$ using 1's and 2's complement method. **(04 Marks)**

b. Convert (i) $(2AD.E3)_{16}$ to its octal and decimal equivalents.

(ii) $(1456.72)_8$ to its decimal and Hexadecimal equivalents. **(04 Marks)**

c. Explain the 'OR' and 'AND' operation using diodes. **(06 Marks)**

d. Simplify and realize the expression using Basic gates.

$Y = \overline{AB} + \overline{AC} + A\overline{BC} + (\overline{AB + C})$ **(06 Marks)**

Module – 4

7 a. What is a flip flop? With the help of a logic diagram and truth table, explain the working of a clocked SR flip flop. **(06 Marks)**

b. What is a transducer? Explain the working of LVDT. **(05 Marks)**

c. What is a microprocessor? With a neat block diagram, explain the architecture of 8085 microprocessor. **(09 Marks)**

8 a. What is a Latch? With the help of a logic diagram and truth table, explain the working of a NAND gate latch. **(06 Marks)**

b. List the differences between microprocessors and microcontrollers. **(04 Marks)**

c. Write a short note on:

(i) Resistance thermometer and

(ii) Thermistor. **(10 Marks)**

Module – 5

9 a. What are the commonly used frequency ranges in communication on systems? Mention the applications of each range. **(04 Marks)**

b. Define amplitude modulation. Draw the AM signal and its spectrum. For an amplitude modulated wave, prove that total power is given by, $P_t = P_C\left[1 + \frac{\mu^2}{2}\right]$, where μ is the modulation index. **(06 Marks)**

c. What is ISDN? Explain the services of ISDN. **(05 Marks)**

d. With a neat block diagram, explain the optical fibre communication system. **(05 Marks)**

10 a. With a block diagram, explain typical cellular mobile radio unit. **(05 Marks)**

b. What are the advantages of optical fibre communication? **(05 Marks)**

c. Compare AM and FM modulation schemes. **(04 Marks)**

d. An audio signal frequency signal $5\sin 2\pi(1000)t$ is used to amplitude modulate a carrier of $100\sin 2\pi(10^6)t$. Assume modulation index of 0.4. Find

(i) Sideband frequencies.

(ii) Band width required.

(iii) Amplitude of each side band

(iv) Total power delivered to a load of 100 Ω **(06 Marks)**

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