Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

FIRST SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION
NOV/DEC 2015
SUBJECT: BASIC ELECTRONICS (ECE - 1001)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. A 100V-0-100V, 50 Hz is available at the secondary of the center tapped transformer in a full-wave rectifier with load 500Ω. Calculate the output DC voltage, DC load current and Ripple factor for the cases (a) without capacitive filter and (b) with capacitive filter. Assume C= 1000μF, and ideal diodes. Draw the circuit of full-wave rectifier.

1B. For a Zener voltage regulator output voltage is 10V, load current is 50mA. $P_{z\ max}$= 1000mW. Input voltage varies from 20V to 30V. Draw the circuit and find the maximum and minimum value of Zener current.

1C. A Silicon diode has a saturation current of 1pA at 20^0C. Find the (i) Diode bias voltage when diode current is 3mA. (ii) Diode bias current when the temperature is 100^0C, assuming the diode voltage to be constant.

(5+3+2)

2A. In a self-bias common emitter circuit using NPN transistor R_c = 4.7 kΩ, R_E= 1kΩ, R_1 = 100 kΩ, R_2 = 18 kΩ, V_{CC} = 15V, β = 80 and V_{BE} = 0.6V. Determine the Q point. Draw the circuit and indicate Q point on the output characteristics.

2B. Draw the input and output characteristics of PNP transistor in CB mode and indicate the salient features.

2C. A Germanium transistor with β= 100 has collector base leakage current of 5μA. If the transistor is connected in common emitter configuration, find the collector current for base currents of 0μA and 40μA respectively.

(5+3+2)

3A. A. An Op-amp has inputs V_1 = 10mV and V_2 = 8mV. If the differential gain is 60dB and CMRR is 80 dB calculate differential output voltage and common mode output voltage.

B. Draw a circuit using single op-amp for the following specification: (a) A_v = 1, (b) A_v= -1

3B. Perform the following operations.

i) Give BCD representation of the $(7305)_{10}$ number.

ii) Subtract $(-68)_{10}$ from $(125)_{10}$ using 2's complement.

3C. In a square wave generator using op-amp, find out the value of feedback resistor 'R', connected to the inverting terminal for the following specifications:
Frequency of oscillation = 5 kHz, $V_{o(p-p)}$ = 10V. C = 0.01μF and β = 0.5.

(5+3+2)

4A. i) Simplify the switching function using K-Map.
F(ABC) = A'B'C'+A'B'C+A'BC+A'B C'+ABC

ii) Certain circuit has three inputs say, A, B and C. The output Z will be at logic 1 only if at least two or more inputs are at logic 1. Draw the truth table, give the output expression and implement using logic gates.

4B. Simplify the Boolean expression $Y=A\overline{B}\,\overline{C}+\overline{A}\,\overline{B}\,\overline{C}+\overline{B}\,\overline{C}+A\overline{C}$ and realize using logic gates.

4C. Draw the circuit of 4 bit SISO shift register using D flip-flops.

(5+3+2)

5A. If an audio signal of $10sin\,(2\pi 1000t)$ volts amplitude modulates a carrier of $40sin\,(2\pi 2000t)$ volts, determine:

i. Modulation index
ii. Sideband frequencies
iii. Bandwidth
iv. Total power delivered if $R_L = 1k\Omega$
v. Amplitude of each side band components

5B. List the different network topologies and ISO-OSI layers.

5C. State the sampling theorem. Consider the analog signal x (t) = 3 cos100πt + 10 sin300πt – cos500πt. What is the Nyquist rate of sampling for this signal?

(5+3+2)