B.Sc. Engg. (CSE)/HDCSE, 4th Sem. Date: August 16, 2016 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
Course No.: EEE 4435
Course Title: Digital Electronics and Pulse Techniques

Summer Semester, A. Y. 2015-2016
Time: 90 Minutes
Full Marks: 75

There are **4 (four)** questions. Answer **any 3 (three)** questions. All questions carry equal marks. Marks in the margin indicate full marks. Programmable calculators are not allowed. Do not write on this question paper. All symbols bear their usual meanings. Assume reasonable values for missing data.

---

1. a) Give an example of a summing-integrator circuit. Draw and explain its analog computer model. 3+5

   b) Design a bandpass filter of gain 6; which has cut-off frequencies of 160 Hz and 8 kHz. 10

   c) Design an instrumentation amplifier circuit with a gain of 21 using a single quad OP-AMP IC. 7

2. a) Explain how positive feedback in a zero crossing detector circuit eliminates false output transitions. 9

   b) When can a zero-crossing detector with hysteresis work as a memory element? 5

   c) The voltage divider network of a zero crossing detector circuit with positive feedback has got $R_1 = R_2 = 100$ kΩ. If $+V_{sat} = 14$ V and $-V_{sat} = -13$ V; find out hysteresis voltage and plot V_0 vs E_i. 11

3. a) Compare among SPLD, CPLD and FPGA technologies. 7+4

   b) What are the performance characteristics of a logic circuit? Comparative between CMOS and TTL technology in terms of their performance characteristics. 2+7

   c) If a logic gate operates on a dc supply voltage of +5 V and draws an average current of 4 mA, what is its power dissipation? For a propagation delay of 5 ns, find out the speed power product (SPP). 5

4. a) Explain the principle of operation of an OP-AMP based free-running multivibrator and show that period of oscillation, $T=2R_fC$ holds true, when in the voltage divider network $R_1=1.163\ R_2$. 13

   b) Saturation voltages in a bipolar triangular waveshape generator are +14V and -14V respectively. If $R_1 = R = 10$ kΩ, $pR = 50$ kΩ and $C = 0.1$ μF. 6+6

      i. Find the peak triangular wave voltages and oscillating frequency.

      ii. Find the resulting peak output voltage and frequency of oscillation for a unipolar triangular waveshape generator using same values as initially given for the bipolar triangular wave-generator.