

~~Test 1~~  
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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT  
TEST 1 EXAMINATION - September 2017  
B.Tech ECE 3<sup>rd</sup> Semester

COURSE CODE: 10B11EC312  
COURSE NAME: Analog Electronics  
COURSE CREDITS: 4

MAX. MARKS: 15  
MAX. TIME: 1HR

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

- Q1. (a). Explain why the depletion region extends deeper into the lightly doped region of the PN- Diode. [2]  
(b). Define following terms-  
i. Critical temperature  
ii. Fermi level  
iii. Diffusion length [1+1+1]
- Q2.(a) A stream of excess holes is injected at  $x=0$ . Prove that excess hole concentration decreases exponentially in positive  $x$ - direction due to recombination. [2.5]  
(b). Derive the expression of contact potential under equilibrium in terms of concentration of holes on each side of the junction. [2.5]
- Q3. An abrupt Si PN- junction has  $N_a=10^{15}/\text{cm}^3$ ,  $N_d=10^{17}/\text{cm}^3$ ,  $n_i=10^{10}/\text{cm}^3$ ,  $\epsilon_r=11.8$   $m_n^*=1.1m_0$ ,  $m_p^*=0.56m_0$ , where  $m_0$  is rest mass of electron. At 300K, calculate the Fermi level position for both sides of the junction, draw the equilibrium band diagram and find  $V_0$  from the band diagram. If diode has a circular cross-section with diameter of  $5\mu\text{m}$ , sketch  $E(x)$ . [5]

EC-1, BT