D. J. SANGHVI COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS ENGINEERING
ELECTRONIC DEVICES SEM III
MID TERM 2 SYLLABUS

N.B. : **[Total Marks: 20]**

1) In the paper, there will be several questions covering the mid term 2 syllabus.
2) Carry calculators in the exam room.

✠ MOSFET

1. MOS capacitor as two terminal structure, EBD of MOSCAP in equilibrium and under applied external bias.
2. MOSFET construction and types.
3. Concept of threshold voltage V_T and derivation for the same.
4. Numericals on threshold voltage V_T of both PMOS and NMOS
5. Concept of body effect and its effect on V_T
6. MOSCAP C-V curve for low and high frequencies.
7. Numerical on oxide capacitance, flat band capacitance and minimum gate capacitance. (*not in Mid-term 2*, but there in *syllabus*)
8. Derivation for I_D in linear region, i.e Gradual channel approximation for N-channel MOSFET.
9. Derivation for I_D in saturation region, i.e Channel length modulation for N-channel MOSFET.
10. ED lecture 28 dated 26-09-2016 contents (i.e simple numericals on MOSFET region of operation, transconductance concept and MOSFET model)
11. Short Channel Effect in MOSFETs (*not in Mid-term 2*, but there in *syllabus*)
12. Sub-threshold conduction current and its significance in MOSFETs (*not in Mid-term 2*, but there in *syllabus*)

✠ METAL SEMICONDUCTOR JUNCTIONS

1. Rectifying contact (Schottky barrier diode): EBD of metal–n type semiconductor for ($\phi_m > \phi_s$) case in equilibrium, formation of Schottky barrier, EBD in forward and reverse bias.
2. Ideal junction properties (i.e evaluation of E_m, W, ρ) for metal–n type semiconductor for ($\phi_m > \phi_s$) case.
3. Numerical on metal semiconductor junction i.e finding a) Ideal Schottky barrier height, b) built-in potential barrier, c) space charge width, and d) max E-field depletion capacitances at zero-bias or applied given bias.
4. EBD of metal–p type semiconductor for ($\phi_m < \phi_s$) case.

5. Metal semiconductor ohmic contact: EBD of metal–n type semiconductor for ($\phi_m < \phi_s$) case at equilibrium, forward and reverse bias.
6. EBD of metal–p type semiconductor for ($\phi_m > \phi_s$) case.
7. Difference between Schottky diode and pn diode
8. Metal semiconductor ohmic contact: Tunneling barrier and specific contact resistance.
9. I-V characteristics of a Schottky barrier diode based on thermionic emission.
10. Non-ideal effects on barrier height : Fermi-level pinning, effect of surface states, Schottky effect. (*not in Mid-term 2*, but there in *syllabus*)

✠ HETERO-JUNCTIONS

1. Heterojunction materials.
2. EBD of narrow and wide bandgap materials (i.e concept of straddling, staggered and broken gap).
3. EBD of various heterojunctions before and after contact (i.e equilibrium case).
4. Two dimensional electron gas concept.

✠ POWER DEVICES

1. SCR: Basic structure, working and characteristics.
2. DIAC: Basic structure, working and characteristics.
3. TRIAC: Basic structure, working and characteristics.
4. UJT: Basic structure, working and characteristics.

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