Printed Pages: 6 **EEC-401/EC-401 (MTU)**

(Following Paper ID and Roll No. to be filled in your Answer Books)	
Paper ID : 131401	**Roll No.**

B.TECH.

Theory Examination (Semester-IV) 2015-16

ELECTRONICS CIRCUITS

Time : 3 Hours ***Max. Marks : 100***

Note : Attempt all Sections.

Section-A

1. This question consist of short answer questions. Attempt all parts. All parts carry equal marks. (2×10 = 20)

(a) What is Op-amp? Give its equivalent circuit.

(b) For NMOS transistor, write the drain current expression for all its region.

(c) Draw a high frequency T model of n-channel MOSFET incorporating output resistance.

(d) Draw the circuit diagram for CB amplifier.

(e) Calculate β and α for a transistor if emitter current is 10mA and collector current is 9mA.

(f) Define input offset voltage of MOS differential pair.

(g) Explain why voltage divider biasing is preferred.

(h) Define Unity gain frequency.

(i) Draw a large-signal equivalent circuit model NPN transistor, incorporating the output resistance.

(j) Give the Barkhausan conditions to obtain sustained oscillations.

Section-B

2. Attempt any FIVE questions. All questions carry equal marks. [10×5=50]

(a) (i) Define and give the significance of Slew rate and CMRR. For an op-amp having a slew rate of 60 V/ μs, what is the highest frequency at which a 20V

peak to peak sine wave can be produced at the output?

(ii) Describe the characteristics of an Op-amp. Draw the circuit diagram of difference amplifier using op-amp and calculate the differential gain (A_d), common mode gain (A_{cm}) and differential input resistance (R_{id}).

(b) (i) Describe classification of output stage power amplifier. Describe the methods of biasing for class AB power amplifier.

(ii) What do you mean by cross over distortion. Describe how can it be overcome.

(c) Describe the construction and operation of N-channel enhancement MOSFET. Describe the role of substrate (the body effect) in MOSFET.

(d) Draw the high frequency equivalent circuit model for the MOSFET and list all MOSFET internal Capacitances.

(e) (i) Give the circuit for CC amplifier and calculate R_{in} and R_{out} for the CC amplifier.

(ii) Draw the circuit diagram of CB amplifier and calculate expression for short-circuit current gain with T-model.

(f) (i) Discuss the various internal capacitances for BJT. A particular small geometry BJT has f_T of 5 GHz and C_μ = 1pF when opertated at I_C = 0.5mA. What is C_π in this situation? Also find g_m. For $\beta = 150$, find r_π and f_β.

(ii) Draw the circuit diagram of a Wien-bridge oscillator and derive an expression for the frequency of oscillations.

(g) (i) Explain the operation of MOS differential pair with differential input voltage. Also calculate the range of input differential signals.

(ii) For the active loaded BJT differential amplifier let I = 0.8mA, V_A = 100V and $\beta = 160$. Find G_m, R_o, A_d and R_{id}.

(h) (i) Design a series – shunt feedback amplifier and derive expressions for A_f, R_{of} and R_{if}.

(ii) For the Colpitt's oscillator, derive an expression for the frequency of oscillation.

Section-C

Attempt any TWO questions. Each question carry equal marks.
(15×2=30)

3. (a) Explain the effect of finite open loop gain and bandwidth on the circuit performance. Calculate the frequency response of closed loop inverting amplifier.

   (b) Explain the working of BJT as an amplifier and as a switch with the help of neat diagram and necessary equations.Also calculate the amplifier gain.

4. (a) Discuss a common- source amplifier, draw its ac equivalent circuit and obtain expression for its terminal characteristics.

   (b) Describe the operation of class B push-pull power amplifier giving its circuit, also obtain its efficiency.

5. (a) Draw the NMOS differential amplifier with a common-mode input signal and calculate the common Mode Gain and CMRR. Also explain the effect of R_D mismatch on CMRR.

(b) Explain the merits and demerits of negative feedback. Also explain in brief the various topologies used in negative feedback.