(Please write your Exam Roll No.) *Exam Roll No. .*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024-JANUARY 2025

Paper Code: ECC-211 ***Subject: Analog Electronics-I***

Time: 3 Hours ***Maximum Marks: 60***

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt **all** questions:- **(5x4=20)**

(a) Draw a Darlington pair and find out it's current gain.

(b) Explain how Zener diode maintains constant voltage across the load?

(c) The output of a 60 Hz full wave bridge rectifier has a 60 Hz ripple. Is the circuit working properly.

(d) Why emitter is always forward biased? Why collector is always reverse biased w.r.t base.

(e) An amplifier with voltage gain of 60 dB uses 1/20 of its output in negative feedback. Calculate the gain with feedback in dB.

(f) A transformer coupled class A large signal amplifier has maximum and minimum values of collector-emitter voltage of 25V and 2.5V. Determine its collector efficiency?

UNIT-I

Q2 (a) Draw the piecewise linear equivalent circuit of diode and explain it briefly. Explain the effect of temperature on the V-I characteristics of diode. **(4)**

(b) In a centre tap full wave rectifier R_L = 1000 ohm, R_f = 35 ohm. Primary voltage is 220V 50Hz with transformer ratio 5:1. Calculate (i) Average current (ii) d.c output voltage (iii) d.c output power (iv) a.c input power and (v) rectifier efficiency. **(3)**

(c) What are the two basic types of capacitances associated with P-N junction? Explain them. **(3)**

OR

Q3 (a) A voltage across a silicon diode at room temperature of 300K is 0.71V when 2.5 mA current flows through it. If the voltage increases to 0.8V, calculate the new diode current. **(2)**

(b) Draw the circuit diagram of a bridge rectifier and explain its operation with waveforms. Derive expression for its rectification efficiency and ripple factor. **(4)**

(c) Design a clipping circuit to clip a sinusoidal wave of 2V peak voltage at 100 Hz above +1 volt. Draw input and output waveforms. **(4)**

UNIT-II

Q4 (a) What is self bias? Derive the expression for stability factor S(Ico) for self bias circuit. Draw the graph of variation of S(Ico) with change in R_B/R_E. **(5)**

(b) Draw the hybrid equivalent circuit for common emitter configuration and find expression for current gain, voltage gain, input impedance, output impedance. **(5)**

OR

P.T.O.

Q5 (a) Design a self bias circuit for C.E. amplifier having β=99 and stability S=5. The other values are V_{CE} = 6V, V_{RE} =5.5V, V_{CC} = 15V, R_C =2.5k ohm and V_{BE}=0.3V. **(5)**

(b) Draw the structure of an N- channel enhancement type MOSFET. Explain it's working with the help of drain characteristics and transfer characteristics. **(5)**

UNIT-III

Q6 (a) Discuss class B power amplifier and calculate its overall efficiency. **(5)**

(b) A class B push pull amplifier is supplied with V_{cc}=50V. The signal swings the collector voltage down to V_{min}=5V. The total dissipation in both transistors is 40W. Find the total power and conversion efficiency. **(5)**

OR

Q7 (a) Draw the circuit diagram of two stage R-C coupled amplifier. Derive an expression for the voltage gain in mid-frequency region. **(5)**

(b) Explain the need for a multistage amplifier. Draw the circuit of a cascode amplifier and explain its operation. **(5)**

UNIT-IV

Q8 (a) Why is negative feedback involved in high gain amplifiers. Prove in a negative feedback amplifier $\frac{dA_f}{A_f} = \frac{1}{1+\beta A}\frac{dA}{A}$ where A_f is Gain with feedback, A is gainwithout feedback and β is feedback factor. **(5)**

(b) What is piezoelectric effect? Draw the equivalent electric circuit of a quartz crystal and find the expression for resonant frequencies. **(5)**

OR

Q9 (a) Explain the four types of feedback topologies with the help of schematic diagram. **(6)**

(b) Describe Hartley oscillator circuit and explain its action. **(2)**

(c) Find the operating frequency of a transistor Collpitt's oscillator if C1=0.001μF, C2=0.01μF and L=15μH. **(2)**

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