Hall Ticket No | | | | | | | | | | | Question Paper Code: AECC09

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR / SUPPLEMENTARY) - AUGUST 2023
Regulation: UG-20
ANALOG AND PULSE CIRCUITS

Time: 3 Hours **(ELECTRONICS AND COMMUNICATION ENGINEERING)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Classify various amplifiers. Describe in detail about different coupling schemes in amplifiers.
[BL: Understand| CO: 1|Marks: 7]

   (b) A transistor used in CE arrangement has the following set of h parameters when the DC operating point is $V_{CE} = 10$ volts and $I_C = 1$ mA : $h_{ie} = 2000\Omega$; $h_{oe} = 10^{-4}\Omega$; $h_{re} = 10^{-3}$; $h_{fe} = 50$ Determine i) Input impedance ii) Current gain and iii) Voltage gain. The AC load seen by the transistor is $r_L = 600\Omega$. What will be approximate values using reasonable approximations?
[BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) What is the effect of feedback on amplifier? Explain in detail about different feedback amplifiers with neat diagrams. [BL: Understand| CO: 2|Marks: 7]

   (b) A voltage series negative feedback amplifier has a voltage gain without feedback of A=500, input resistance $R_i = 3k\Omega$, output resistance $R_0 = 20k\Omega$ and feedback ratio β=0.01. Calculate the voltage gain A_f, input resistance R_{if} and output resistance R_{of} of the amplifier with feedback.
[BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) State the condition for oscillation. Draw the push-pull class-B power amplifier and explain its operation. Show that the maximum conversion efficiency is 78.5%.
[BL: Understand| CO: 3|Marks: 7]

   (b) Determine the i) Operating frequency ii) Feedback fraction for Colpitts's oscillator shown in Figure 2. [BL: Apply| CO: 3|Marks: 7]

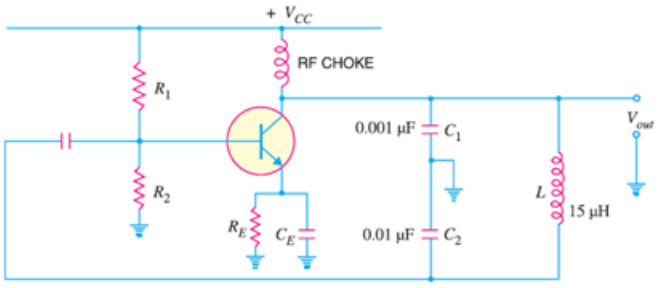

Figure 1

4. (a) Draw and explain the circuit diagram of single tuned capacitive coupled amplifier with its operation in detail. [BL: Understand| CO: 4|Marks: 7]

   (b) A parallel resonant circuit has a capacitor of 250pF in one branch and inductance of 1.25mH plus a resistance of 10Ω in the parallel branch. Find i) Resonant frequency ii) Impedance of the circuit at resonance iii) Q-factor of the circuit. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Sketch the response of the low pass RC circuit for a step input with different time constants and derive the expression for rise time. [BL: Understand| CO: 5|Marks: 7]

   (b) A 10 KHz square wave is applied to high pass RC circuit which produces the output with a tilt of 3.8%. Calculate the lower 3-dB frequency of the circuit. If the circuit uses a capacitor of 0.47 μF, determine the value of the resistance. [BL: Apply| CO: 5|Marks: 7]

6. (a) Explain the operating principle of sampling gate. Draw the circuit diagram of two input diode OR gate and explain it [BL: Understand| CO: 5|Marks: 7]

   (b) Differentiate uni and bi directional sampling gates. Design a bidirectional gate with the help of bridge circuit. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Draw a neat diagram of a transistor astable -multivibrator and explain its principle of operation. [BL: Understand| CO: 6|Marks: 7]

   (b) Calculate the component values of a monostable multivibrator developing an output pulse of 140 µs duration. Assume $h_{fe} = 20$, $I_{c(sat)} = 6mA$, $V_{cc} = 6V$, $V_{bb} = -1.5V$ required. [BL: Apply| CO: 6|Marks: 7]

8. (a) Illustrate the operation of a mono-stable multivibrator with triggering circuits and waveforms and derive an expression for its pulse width. [BL: Understand| CO: 6|Marks: 7]

   (b) Design a Schmitt trigger circuit to have $V_{cc} = 12V$, UTP=5V,LTP=3V and $I_c = 2mA$, using two silicon NPN transistors with h_{fe}=100 and $I_2 = 0.1I_{c2}$ [BL: Apply| CO: 6|Marks: 7]

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