Hall Ticket No | | | | | | | | | | | Question Paper Code: AECB11

# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**
**Dundigal, Hyderabad - 500 043**

## MODEL QUESTION PAPER - II

B.Tech IV Semester End Examinations, April - 2020
**Regulation: IARE-R18**
**ANALOG AND PULSE CIRCUITS**
**(Electronics and Communication Engineering)**

**Time: 3 Hours** **Max Marks: 70**

Answer any ONE question from each Unit
All questions carry equal marks
All parts of the question must be answered in one place only

### UNIT – I

| | | | |
|---|---|---|---|
| 1 | a) | List out the special features of Darlington pair and cascode amplifiers. State the areas where these amplifiers are used? | [7M] |
| | b) | A CE-CC Amplifier uses RS=1KΩ, . RC1= RE2=4KΩ . The hparameters hie=1.2K, hre=5*10-4,hfe=50,hoe=25μA/V, hic=1.2 Ω ,hrc=1,hfc= -51,hoc=25μA/V. Compute individual & overall A I & AV,Ri, Ro & Rot . | [7M] |
| 2 | a) | Sketch two RC-coupled CE transistor stages. Show the middle and low frequency model for one stage. Write the expressions for current gains. | [7M] |
| | b) | A Darlington emitter follower circuit uses two identical transistors having the following h-parameters hie=1.1K, hre=2.5*10-4,hfe=60,hoe=20μA/V. RE=2KΩ,RS=500Ω Compute overall A I & AV, Ri, Ro & Rot . | [7M] |

### UNIT – II

| | | | |
|---|---|---|---|
| 3 | a) | What are the advantages and disadvantages of negative feedback and compare different types of feedback circuits. | [7M] |
| | b) | A feedback amplifier has an open loop gain of 600 and feedback factor β = 0.01. Find the closed loop gain with feedback. | [7M] |
| 4 | a) | Derive the expressions for Av, Ri and Ro for the series – shunt feed back amplifier circuit. | [7M] |
| | b) | An amplifier with Av = - 500, produces 5% harmonic distortion at full output. What value of β is required to reduce the distortion to 0.1 % ?What is the overall gain? | [7M] |

### UNIT – III

| | | | |
|---|---|---|---|
| 5 | a) | Deduce the Barkausen Criterion for the generation of sustained oscillations. | [7M] |

b) Find the capacitor C and hfe for the transistor to provide a resonating frequency of 10KHZ of a phase-shift oscillator. Assume R1=25k,R2=60k,Rc=40k, R=7.1k and hie=1.8k. [7M]

6 a) Derive the general expression for the output power in the case of a class A power amplifier. Draw the circuit and explain the movement of operating point on the load line for a given input signal. [7M]

b) A series fed class A amplifier uses a supply voltage of 10V and load resistance of 20 Ω. [7M]

The a.c input voltage results in a base current of 4mA peak. Calculate

i. d.c input power

ii. a.c output power

iii. % of efficiency

**UNIT – IV**

7 a) Explain the response of RC High Pass circuit for the square input, and draw the response with different time constants. [7M]

b) A 1KHz square wave output from an amplifier has rise time tr = 250 ns and tilt = 10%, identify the upper and lower frequencies [7M]

8 a) Explain the response of RC Low Pass circuit for the square input, and draw the response with different time constants. [7M]

b) Draw the RC differentiator circuit for pulses of 1ms repletion and 10V amplitude. The trigger pulses are to have 8V amplitude. The source resistance is 50Ω and load resistance is 500Ω. [7M]

**UNIT – V**

9 a) Explain with the help of neat circuit diagram the principle of operation of monostable multivibrator, and derive an expression for pulse width. [7M]

b) Design a Schmitt trigger circuit using NPN transistors having hFE(MIN)=60 . VBE cut-off = 0V, VCE(Sat) = 0.2V and VBE(Sat) = 0.7V. GivenVcc=8V and o/p swing = 6V, UTP = 3.5V, LTP = 1.5V, R1 = 10K Ω & R2 = 2K Ω. Determine Rc1, Rc2 and Re. [7M]

10 a) Discuss the operation of Schmitt trigger with UTP and LTP. [7M]

b) Consider the Schmitt trigger with germanium transistor having hfe= 20.The circuit parameter are Vcc = 15V, Rs = 2kΩ, Rc1= 4kΩ, R1= 1 kΩ= 3 kΩ R2 = 10 kΩ and Re= 6 kΩ.Find LTP and UTP. [7M]

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## COURSE OBJECTIVES
The course should enable the students to:

| S.No | Description |
|---|---|
| I | Learn the concepts of high frequency analysis of transistors. |
| II | Understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers. |
| III | Familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback. |
| IV | Construct various multivibrators using transistors. |

## COURSE OUTCOMES (COs):

| | |
|---|---|
| CO 1 | Discuss the frequency response and analysis of multistage amplifiers and transistor at high frequency |
| CO 2 | Analyze the effect of feedback on Amplifier characteristics in feedback amplifiers |
| CO 3 | Discuss the frequency response of various oscillators and analyze the large signal and tuned amplifiers |
| CO 4 | Understand the linear wave shaping and different types of sampling gates with operating principles using diodes, transistors |
| CO 5 | Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors |

## COURSE LEARNING OUTCOMES
Students who complete the course will have demonstrated the ability to do the following.

| | |
|---|---|
| AECB07.01 | Understand the classification of amplifiers, distortions in amplifiers and different coupling schemes used in amplifiers. |
| AECB07.02 | Analyze various multistage amplifiers such as Darlington, Cascade etc. |
| AECB07.03 | Understand and remember the concept of Hybrid - model of Common Emitter transistor. |
| AECB07.04 | Analyze the importance of positive feedback and negative feedback in connection in electronic circuits. |
| AECB07.05 | Analyze various types of feedback amplifiers like voltage series, voltage shunt, current series and current shunt. |
| AECB07.06 | Understand the condition for Oscillations and various types of Oscillators. |
| AECB07.07 | Design various sinusoidal Oscillators like RC Phase shift, Wien bridge, Hartley and Colpitts oscillator for various frequency ranges. |
| AECB07.08 | Design different types of power amplifiers for practical applications of desired specifications like efficiency, output power, distortion, etc. |
| AECB07.09 | Design the tuned circuits used in single tuned amplifiers and understand its frequency response. |
| AECB07.10 | Analyze the response of high pass RC to different non sinusoidal inputs with different time constants and identify RC circuit's applications. |

| | |
|---|---|
| AECB07.11 | Understand the basic operating principle of sampling gates. |
| AECB07.12 | Analyze the response of low pass RC circuits to different non sinusoidal inputs with different time constants and identify RC circuit's applications. |
| AECB07.13 | Illustrate the Bistable multivibrator with various triggering methods and apply design procedures to different bistable multivibrator circuits. |
| AECB07.14 | Analyze the Monostable, Astable multivibrator circuits with applications and evaluate time, frequency parameters. |
| AECB07.15 | Evaluate triggering points, hysteresis width of Schmitt trigger circuit and also design practical Schmitt trigger circuit. |

## MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

| SEE Question No. | | Course Learning Outcomes | | Course Outcomes | Blooms Taxonomy Level |
|---|---|---|---|---|---|
| 1 | a | AECB07.02 | Analyze various multistage amplifiers such as Darlington, Cascade etc. | CO 1 | Understand |
| | b | AECB07.02 | Analyze various multistage amplifiers such as Darlington, Cascade etc. | CO 1 | Remember |
| 2 | a | AECB07.02 | Analyze various multistage amplifiers such as Darlington, Cascade etc. | CO 1 | Understand |
| | b | AECB07.02 | Analyze various multistage amplifiers such as Darlington, Cascade etc. | CO 1 | Remember |
| 3 | a | AECB07.04 | Analyze the importance of positive feedback and negative feedback in connection in electronic circuits | CO 2 | Remember |
| | b | AECB07.04 | Analyze the importance of positive feedback and negative feedback in connection in electronic circuits | CO 2 | Apply |
| 4 | a | AECB07.05 | Analyze various types of feedback amplifiers like voltage series, voltage shunt, current series and current shunt. | CO 2 | Remember |
| | b | AECB07.04 | Analyze the importance of positive feedback and negative feedback in connection in electronic circuits | CO 2 | Apply |
| 5 | a | AECB07.06 | Understand the condition for Oscillations and various types of Oscillators | CO 3 | Remember |
| | b | AECB07.06 | Understand the condition for Oscillations and various types of Oscillators | CO 3 | Apply |
| 6 | a | AECB07.07 | Design various sinusoidal Oscillators like RC Phase shift, Wien bridge, Hartley and Colpitts oscillator for various frequency ranges. | CO 3 | Understand |
| | b | AECB07.08 | Design different types of power amplifiers for practical applications of desired specifications like efficiency, output power, distortion, etc | CO 3 | Apply |
| 7 | a | AECB07.10 | Analyze the response of high pass RC to different non sinusoidal inputs with different time constants and identify RC circuit's applications | CO 4 | Understand |
| | b | AECB07.10 | Analyze the response of high pass RC to different non sinusoidal inputs with different time constants and identify RC circuit's applications | CO 4 | Apply |
| 8 | a | AECB07.12 | Analyze the response of low pass RC circuits to different non sinusoidal inputs with different time constants and identify RC circuit's applications | CO 4 | Remember |

| | | | | | |
|---|---|---|---|---|---|
| | b | AECB07.12 | Analyze the response of low pass RC circuits to different non sinusoidal inputs with different time constants and identify RC circuit's applications | CO 4 | Apply |
| 9 | a | AECB07.14 | Analyze the Monostable, Astable multivibrator circuits with applications and evaluate time, frequency parameters | CO 5 | Understand |
| | b | AECB07.15 | Evaluate triggering points, hysteresis width of Schmitt trigger circuit and also design practical Schmitt trigger circuit | CO 5 | Understand |
| 10 | a | AECB07.15 | Evaluate triggering points, hysteresis width of Schmitt trigger circuit and also design practical Schmitt trigger circuit | CO 5 | Apply |
| | b | AECB07.15 | Evaluate triggering points, hysteresis width of Schmitt trigger circuit and also design practical Schmitt trigger circuit | CO 5 | Apply |

**Signature of Course Coordinator** **HOD, ECE**