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Question Paper Code : 90474

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fourth Semester

Electronics and Communication Engineering

EC 8452 — ELECTRONIC CIRCUITS – II

(Common to Electronics and Telecommunication Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Though the circuit gain is less in negative feedback amplifiers, why is it preferred in many electronic circuits?

2. Shunt-Series amplifier is also called as ———— amplifier and its transfer function is ————.

3. State the Barkhausen criteria for producing sustained oscillations.

4. Which of the oscillator(s) provide greater stability of operation? Justify your answer.

5. Which of the two tuned-amplifier configurations do not suffer from Miller effect? Why?

6. Assume that the output of the tuned amplifier must be coupled to the input of another amplifier. Suggest a suitable solution to raise the effective input resistance of the second amplifier, without reducing the overall Q factor.

7. Using pn junction diode(s), draw a circuit that produce the response shown in Figure 1.

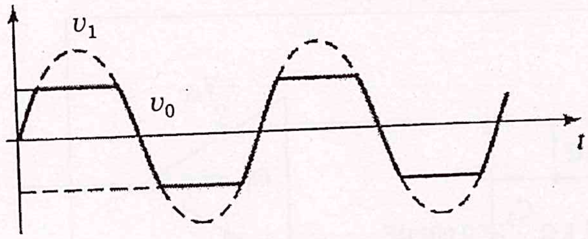

Figure 1

8. Depict the response of an RC integrator and differentiator circuits.

9. If the current gain of the two transistors in a Darlington pair configuration is 20 and 50, find the overall current gain?

10. Sketch the safe operating of a BJT considering its thermal breakdown.

PART B — (5 × 13 = 65 marks)

11. (a) Give an example of ideal shunt — shunt negative feedback amplifiers. Draw its small signal equivalent circuit and derive the gain with feedback, input resistance with feedback and output resistance with feedback.

Or

(b) For the negative feedback amplifier shown in Figure 2, $R_s = \infty$, $I_i = 100\mu A$,, $I_{fb} = 99\mu A$ and $I_0 = 5\,mA$; determine A_i, β_i and A_{if}. Also determine R_{if} and R_{of} for $R_i = 5\ k\Omega$ and $R_0 = 4\ k\Omega$.

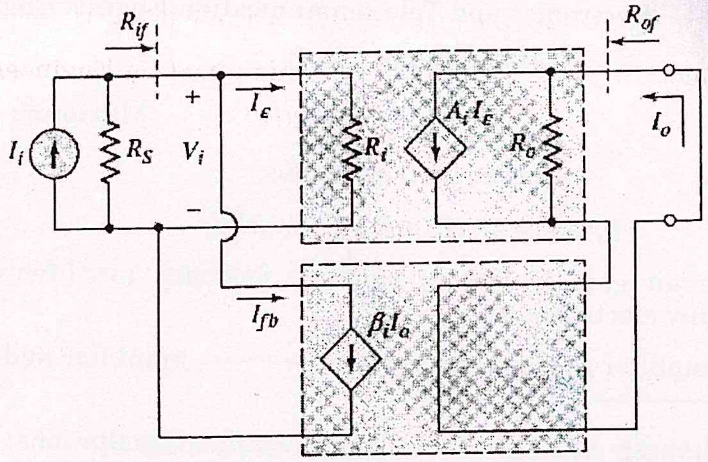

Figure 2

12. (a) Consider a three stage RC phase shift oscillator and derive an expression to determine its frequency of oscillation and the condition required for oscillation.

Or

(b) (i) Using any one of the active device, draw and explain the Hartley oscillator and derive its resonant frequency. (9)

(ii) Calculate the resonant frequency of the Wien bridge oscillator circuit shown in Figure 3. (4)

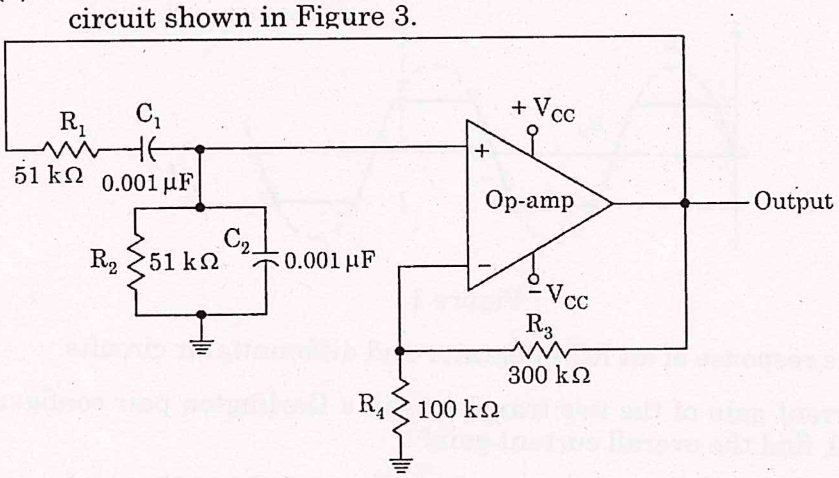

Figure 3

13. (a) Consider a MOSFET with a tuned circuit load. From its equivalent circuit, derive an expression for its voltage gain, center frequency, bandwidth, Q factor and center frequency gain. Represent the inductor losses in the tuned circuit by a relevant equation.

Or

(b) Analytically explain how synchronous tuning and stagger tuning provides maximal flatness in the pass band frequency response of tuned amplifiers.

14. (a) Trigger an op-amp based monostable multivibrator circuit and explain its operation with the signal waveforms. Derive an expression to determine the pulse duration.

Or

(b) Consider the inverting Schmitt trigger circuit shown in Figure 4 and explain its operation. Derive an expression to determine the hysteresis width. Calculate the same if $R_1 = 10\ k\Omega$ and $R_2 = 90\ k\Omega$. Let $V_H = +10V$ and $V_L = -10V$.

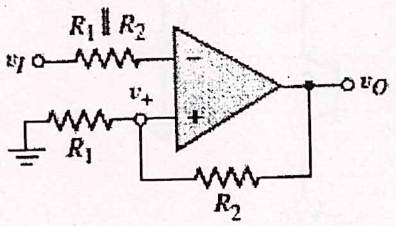

Figure 4

15. (a) (i) Relate the maximum power dissipation with that of the maximum junction temperature of the transistor. What are the different methods used to dissipate the heat produced? Draw the electrical analog of thermal conduction process when a heat sink is utilized to dissipate the heat produced in the transistor. (10)

(ii) A BJT is specified to have a maximum power dissipation of 2 W at an ambient temperature of 25°C, and a maximum junction temperature of 150°C. Find the thermal resistance. (3)

Or

(b) (i) Suggest a suitable method to eliminate crossover distortion in Class AB power amplifier. Draw a class AB output stage, its transfer characteristics, and derive an equation to determine its output resistance. (9)

(ii) Modify this power amplifier using a Darlington pair and explain its effect on the output stage. Bias the same using a V_{BE} multiplier. (4)

PART C — (1 × 15 = 15 marks)

16. (a) Design a Class B output stage as shown in Figure 5 to deliver an average power of 20 W to an 8-Ω load. The power supply should be selected such that Vcc is about 5 V greater than the peak output voltage in order to avoid transistor saturation, nonlinear distortion and provide short circuit protection. Determine the supply voltage required, the peak current drawn from each supply, the total supply power, and the power conversion efficiency. Also determine the maximum power that each transistor must be able to dissipate safely.

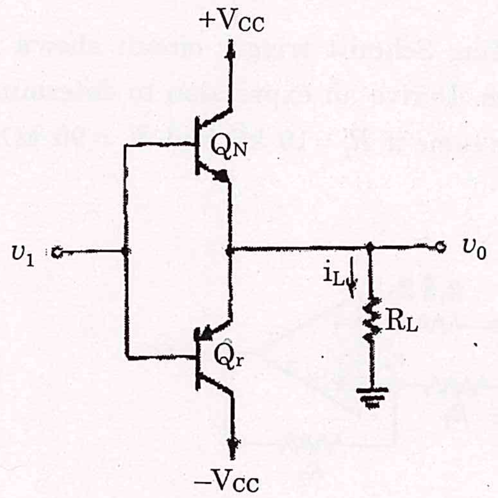

Figure 5

Or

(b) (i) A multipole amplifier having a first pole at 1 MHz and an open loop gain of 100 dB is to be compensated for closed loop gains as low as 20 dB. Use additional capacitance at the circuit node at which the first pole is formed to reduce the frequency of the first pole. If the frequency of the second pole is 10 MHz and if it remains unchanged while additional capacitance is introduced as mentioned, find the frequency to which the first pole must be lowered so that the resulting amplifier is stable for closed loop gain as low as 20 dB. By what factor must the capacitance at the controlling node be increased? (12)

(ii) If the multipole amplifier mentioned above is to be compensated by the introduction of a new dominant pole, at what frequency must the new pole be placed? (3)

———————