Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

EVENING

[Total No. of Questions: 09]
Uni. Roll No. .....

0 7 JUL 2022

[Total No. of Pages: 02]

Program: B.Tech. (Batch 2018 onward)
Semester: 4
Name of Subject: Analog Circuits
Subject Code: PCEC-106
Paper ID: 16222

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.

Part – A

[Marks: 02 each]

Q1.

a) Define Barkhausen's Criteria for sustained oscillation.

b) Compare positive feedback and negative feedback in electronic circuits.

c) List any four performance parameters of an op-amp with their units.

d) Classify voltage regulators.

e) A parallel resonant circuit has a capacitor of 250 pF in one branch and inductance of 1.25 mH with a resistance of 10 Ω in the parallel branch. Determine resonant frequency.

f) Distinguish between Class A and Class B power amplifiers.

Part – B

[Marks: 04 each]

Q2. Explain the working of RC Phase Shift Oscillator.

Q3. Classify coupling in multistage amplifiers.

Q4. Make use of an op-amp to build integrator and solve for its output voltage.

Q5. Prove that the maximum efficiency of Class B push-pull amplifier is 78.5%.

Q6. Examine the causes and effects of harmonic distortion in power amplifiers.

Q7. Determine the oscillator frequency for Hartley oscillator with circuit values: $C = 250$ pF, $L_1 = 1.5$ mH, $L_2 = 1.5$ mH, and mutual coupling, $M = 0.5$ mH.

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Part – C 07 JUL 2022 **[Marks: 12 each]**

Q8. Illustrate the impact of negative feedback on amplifier gain, input impedance, output impedance and bandwidth.

OR

(i) Compare single-tuned and double-tuned amplifiers.

(ii) Explain the working of Complementary-symmetry amplifier.

Q9. **(i)** Determine input bias currents at each input of an op-amp having specified values of Input Offset Current, I_{IO} = 5 nA and Average Bias Current, I_{IB}=30 nA.

(ii) For an op-amp having a slew rate of SR = 2 V/μs, determine the maximum closed-loop voltage gain that can be used when the input signal varies by 0.5 V in 10 μs.

(iii) Evaluate the cutoff frequency of a first-order low-pass filter for R_1 = 1.2 kΩ and C_1 = 0.02 μF.

OR

(i) Calculate the output voltage of an op-amp summing amplifier for the following sets of voltages and resistors. Use feedback resistance, R_f = 1 MΩ in all cases.

(a) V_1= +1 V, V_2= +2V, V_3= +3V, R_1=500 kΩ, R_2= 1 MΩ, R_3= 1 MΩ.

(b) V_1= -2 V, V_2= +3 V, V_3= +1V, R_1=200 kΩ, R_2= 500 kΩ, R_3= 1 MΩ.

(ii) Determine the output voltage of an op-amp for input voltages of V_{i1} = 150 μV and V_{i2} = 140 μV. The amplifier has a differential gain of A_d = 4000 and the value of CMRR is 100.

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