

CS/B.Tech/EE/EEE/ICE/Odd/Sem-3rd/EC(EE)-301/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY,
WEST BENGAL**

EC (EE)-301

ANALOG ELECTRONIC CIRCUITS

Time Allotted: 3 Hours

Full Marks: 70

*The questions are of equal value.
The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.*

**GROUP A
(Multiple Choice Type Questions)**

1. Answer any *ten* questions. 10×1 = 10
- (i) The input resistance of a common-base(CB) amplifier is
 (A) very low (B) very high
 (C) same as CE amplifier (D) same as CC amplifier
- (ii) A certain common-emitter (CE) amplifier has voltage gain 100. If the emitter bypass capacitor is removed
 (A) circuit will become unstable
 (B) voltage gain will decrease
 (C) voltage gain will increase
 (D) Q-point will shift

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- (iii) In a biasing circuit whose stability factor is 10, if I_{CQ} is increased by $1\mu A$ then I_C will be increased by
 (A) $1\mu A$ (B) $10\mu A$
 (C) $1mA$ (D) $100\mu A$
- (iv) The h-parameter values do not depend on
 (A) transistor characteristics (B) transistor configuration
 (C) transistor type (D) operating point
- (v) The output voltage of an amplifier is 10V at 5 KHz and 7.07V at 25 KHz. The decibel change in the output power level is
 (A) - 1 dB (B) 0 dB
 (C) - 3 dB (D) - 0.707 dB
- (vi) In a class A series fed amplifier using a transistor, under ideal conditions, the maximum AC power delivered is 1 watt, the maximum transistor dissipation capability has to be
 (A) 1 watt (B) 2 watts
 (C) 0.25 watt (D) 4 watts
- (vii) For a class B amplifier providing a 20V peak signal to 16Ω load and power supply of $V_{CC} = 30V$, the efficiency will be
 (A) 52.3% (B) 25.65%
 (C) 75% (D) 78.5%
- (viii) Power amplifier handles signal which is compared to voltage amplifier
 (A) small (B) very small
 (C) large (D) none of these
- (ix) Unity gain bandwidth means
 (A) Gain = 1 dB (B) Gain = 0 dB
 (C) Bandwidth = 1 (D) Gain \times Bandwidth = 1

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(x) The output pulse width of a monostable multivibrator using IC 555 where external capacitor and resistor are $0.1 \mu\text{F}$ and $9.1 \text{ K}\Omega$ is

- (A) 1 S (B) 1 mS
(C) 1 μS (D) 2 μS

(xi) Differential amplifier can be used to amplify

- (A) only a.c. signal (B) only d.c. signal
(C) both (A) and (B) (D) none of these

(xii) The condition of oscillation is

- (A) $A\beta = 1$
(B) feedback must be regenerative
(C) phase angle must be zero or integral multiple of 360°
(D) all of these

(xiii) The voltage gain of emitter follower is

- (A) 1 (B) close to 1
(C) greater than 1 (D) much greater than 1

GROUP B (Short Answer Type Questions)

Answer any *three* questions.

3 × 5 = 15

2. Compare between Class A, Class B and Class AB amplifier. 5
3. Draw the high frequency model of a transistor and define all parameters. 5
4. Find out the condition of an astable multivibrator so that its duty cycle would be less than 50% and draw the circuit diagram. 5

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5. What is the difference between series and shunt regulators? Draw the circuit diagram of a series regulator. 5

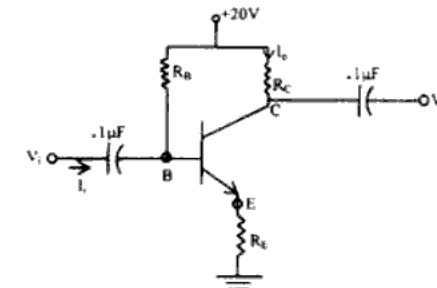
6. Explain logarithmic amplifier with circuit diagram. 5

GROUP C (Long Answer Type Questions)

Answer any *three* questions.

3 × 15 = 45

7. (a) What are the factors affecting stability of Q-point? 3
- (b) Draw the circuit diagram of an emitter follower and explain the nature of feedback in this circuit. What is the feedback topology of the emitter follower? Derive an expression for the voltage gain of the circuit from the concept of feedback. 2+1+3
- (c) In the small signal amplifier $h_{fe} = 100$, $h_{ie} = 560\Omega$, $R_c = 2\text{ k}\Omega$, $R_E = 1\text{ k}\Omega$, $R_B = 600\text{ k}\Omega$, h_{re} and h_{oe} are negligible 6



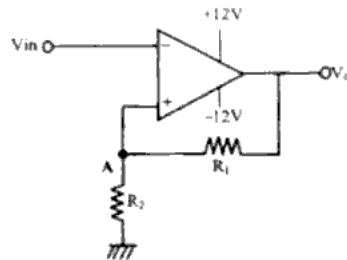
Calculate the input and output impedance and voltage gain by the amplifier. Give the dc load line and the Q-point of the circuit.

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8. (a) Explain the operation of an Instrumentation Amplifier circuit. 5
- (b) For the Schmitt trigger circuit shown in the following figure, calculate R_2 , if $R_1 = 100 \text{ k}\Omega$ and hysteresis voltage width = 4V. Assume saturation voltages to be +12V to -12V. 6



- (c) Draw the circuit diagram of voltage to current converter (grounded load) and explain its operation. 4
9. (a) Draw the circuit of Wienbridge Oscillator using Op-Amp and describe its working. Find an expression for the frequency of oscillation. (4+6)
- (b) A Wein Bridge Oscillator is to span a range of frequencies from 30 Hz to 30 kHz. The variable capacitance can be changed from 50 pF to 500 pF. Find the resistances needed to span the frequency range. If the gain of the amplifier is 6, what must be the ratio of the resistance in the other arms of the bridge? 5
- 10.(a) Draw the circuit diagram of a class C power amplifier and explain. 5
- (b) Derive the maximum efficiency of a class B push pull amplifier. What is the major drawback of class B operation and how it can be avoided? 5+2
- (c) What is the function of tuned amplifier? 3

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11. Write short notes on any *three* of the following: 3×5
- (a) Comparator
 - (b) RC phase shift Oscillator
 - (c) Monostable multivibrator using 555 timer
 - (d) Differential Amplifier using BJT
 - (e) Precision Rectifier