

CS/B.Tech/ECE/Odd/Sem-3rd/EC-304/2014-15

EC-304

ANALOG ELECTRONICS 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.

GROUP A
(Multiple Choice Type Questions)

1. Answer any ten questions. 10 × 1 = 10
- (i) A 1 ms pulse can be stretched to 1 s pulse by using
 (A) An astable multivibrator ☒ (B) A monostable multivibrator
 (C) A bistable multivibrator ☐ (D) A Schmitt trigger
- (ii) Which one of the following power amplifiers has the maximum efficiency?
 (A) Class A ☒ (B) Class B
 (C) Class AB ☐ (D) Class C
- (iii) Which one of the following oscillators is used for generation of high frequencies?
 (A) RC phase shift oscillator ☒ (B) Wien Bridge oscillator
 (C) LC oscillator ☐ (D) Blocking oscillator
- (iv) An amplifier with an initial open loop gain of 400 is used as negative feedback amplifier. The feedback factor is 0.05. If the gain of the amplifier changes by 10% due to temperature, then the closed loop gain will change approximately by
 (A) 0.05% ☒ (B) 0.1%
 (C) 0.5% ☐ (D) 1%

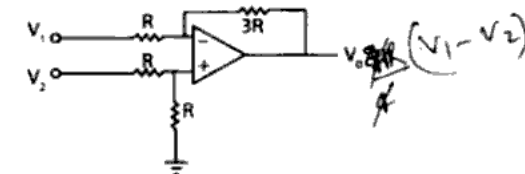
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- (v) Thermal runaway in a transistor biases in the active region is due to
☒ (A) heating of the transistor
 (B) changes in β , which increases with temperature.
 (C) base emitter voltages V_{BE} , which decreases with rise in temperature.
☒ (D) change in reverse saturation current due to rise in the temperature
- (vi) The ideal characteristics of a stabilizer is
 (A) constant output voltage with low internal resistance
 (B) constant output voltage with high internal resistance
 (C) constant internal resistance with variable output voltage
 (D) none of these
- (vii) Removing bypass capacitor across the emitter leg resistor in CE amplifier causes
 (A) increase in current gain ☐ (B) decrease in current gain
 (C) increase in voltage gain ☐ (D) decrease in voltage gain
- (viii) An instrumentation amplifier
 (A) is a differential amplifier ☐ (B) has a gain less than one
 (C) has very high output impedance ☐ (D) has low CMRR
- (ix) The value of V_0 is given for the following circuit is given by



- ☒ (A) $-3V_1 + 2V_2$ ☐ (B) $-3V_2$
☐ (C) $-2.25V_1 + 1.5V_2$ ☐ (D) $-2V_1 + 3V_2$
- (x) Schmitt trigger uses
 (A) negative feedback ☒ (B) positive feedback
 (C) pull up resistor ☐ (D) compensating capacitor

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(xi) Base to emitter V_{BE} in a forward biased transistor decreases with increase of temperature at the following rate

- (A) 25 mV/°C (B) 0.25 mV/°C
(C) 2.5 mV/°C (D) 0.6 mV/°C

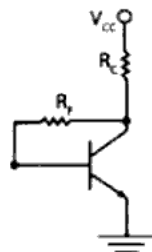
(xii) Which of the following configuration can be used as buffer

- (A) CE (B) CB
(C) CC (D) All of these

GROUP B**(Short Answer Type Questions)**Answer any *three* questions.

3×5 = 15

2. In the circuit shown in the figure, $V_{CC} = 10$ V, $R_C = 2.7$ k Ω , $R_F = 200$ k Ω , $\beta = 99$, $V_{EB} = 0.6$. Determine the operating point (V_C , I_C).



3. How does the negative feedback affect the characteristics of an amplifier? 5
4. What is Common Mode Rejecting Ratio (CMRR) and slew rate of operational amplifier? 5
5. Write a note with related mathematical derivation of Op-Amp as a non inverting amplifier. What is buffer? 5
6. What is PLL? Define the terms (i) capture range (ii) lock in range (iii) pull in time. 2+1+1+1

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GROUP C
(Long Answer Type Questions)Answer any *three* questions.

3×15 = 45

7. (a) Explain the operation of astable multivibrator using 555 timer. Derive the expressions for frequency in case of output waveform. 5+5
(b) Draw and explain the operation of a monostable multivibrator using 555 timer. 5
8. (a) What is power amplifier? Draw and explain a class-A power amplifier. 6
(b) What are the advantages of push-pull amplifier? Why the push-pull circuit is called so? 5
(c) What is cross-over distortion in a class-B amplifier? How is it eliminated? 4
9. (a) Sketch the circuit of Wien Bridge oscillator. Explain the principle of operation and prove that the gain of the amplifier used in Wien Bridge oscillator must be greater than 3 for sustained oscillations. 7
(b) Explain the operation of a crystal oscillator. Mention its two advantages. 3
(c) A Wien Bridge oscillator is to span a range of frequencies from 30 Hz to 30 kHz. The variable capacitance can be change from 50 pF to 500 pF. Find the resistance 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) Define hybrid parameters for a basic transistor circuit in common emitter configuration and give its hybrid model. 6
(b) Explain the quiescent point and load line of a transistor amplifier. 4
(c) Design a self-bias circuit to establish the Q-point at $I_C = 1$ mA using a collector supply $V_{CC} = 12$ V. Assume $\beta = 100$, $V_{BE} = 0.7$ V. 5
11. Write short notes on any *three* of the following. 3×5
- (a) High frequency model of transistor
(b) Current mirror
(c) Comparator
(d) Class-C amplifier
(e) Capacitor filter and π -section filter.

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