Exam.Code:0928
Sub. Code: 6907

2062

B.E. (Electronics and Communication Engineering)

Fourth Semester

EC-406: Analog Electronic Circuits

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section. Use of scientific calculator is allowed.

x-x-x

1. Answer the following:-

(a) Why generator output level is kept constant in obtaining frequency response of an amplifier? (1)

(b) Why the coupling capacitor is large in RC coupling scheme? (1)

(c) Which multistage amplifier is used to amplify DC signal? (1)

(d) Which one of the four differential amplifier configurations is not used and why? (1)

(e) Why DC analysis of a differential amplifier circuit is required? (1)

(f) What is feedback factor? (1)

(g) Why gain bandwidth product remains constant with the introduction of negative feedback? (1)

(h) What is thermal drift? (1)

(i) Why IC 741 is not used for high frequency applications? (1)

(j) What are the merits and demerits of Dominant-pole compensation? (1)

SECTION A

2. (a) In an amplifier, the output power is 1.5W at 2 kHz and 0.3W at 20 Hz, while the input power is constant at 10 mW. Calculate by how many decibels gain at 20 Hz is below that at 2 kHz? (5)

(b) In an amplifier, the maximum voltage gain is 2000 and occurs at 2 kHz. It falls to 1414 at 10 kHz and 50 Hz. Find - (5)
(i) Bandwidth (ii) Lower cut-off frequency (iii) Upper cut-off frequency.

3. (a) An amplifier has a voltage amplification Av = 100 and a fraction $m_v = 0.1$ of its output is fedback in opposition to the input. Calculate the percentage change in the gain of the system if Av falls 6 db due to ageing. (5)

(b) The gain and distortion of an amplifier are 150 and 5% respectively without feedback. If the stage has 10% of its output voltage applied as negative feedback, find the distortion of the amplifier with feedback. (5)

4. (a) Derive mathematical expressions and show how negative feedback affects gain, output impedance and bandwidth of OP-AMP. (5)

(b) The transistors Q_1 and Q_2 with the current gains of 99 and 49 respectively are forming Darlington pair, where emitter of Q_2 is connected to the base of the Q_1. Find the base current in Q_2 if emitter current in Q_1 is 50 mA. (5)

SECTION B

5. Design a series voltage regulator using an operational amplifier and a 6V zener diode to maintain a regulated output of 18V. Assume that the unregulated input varies between 20V and 30V and that the current through the zener diode must be at least 20 mA to keep it in its breakdown region. (10)

6. (a) What are the steps involved in designing a low pass filter? Design a low pass filter at a cut-off frequency of 1 kHz with a pass band gain of 2. (5)

(b) Construct an adder circuit using op-amp to get the output expression as - (5)
$V_o = -(V_1 + 0.5V_2 + 0.3V_3)$

7. (a) Design a differentiator to differentiate an input signal that varies in frequency from 10 kHz to about 1 MHz. If a sine wave of 1V peak at 100 kHz is applied to this designed differentiator, what will be its output? (5)

(b) Design a 2^{nd} order low pass filter at a high cut-off frequency of 1 kHz. (5)

x-x-x