Con. 8868-13. **GS-7083**

(3 Hours) **[Total Marks : 100**

N.B.
1. **Q 1 is compulsory**
2. Answer **any four** out of remaining **six** questions
3. Assumptions made should be clearly stated
4. Assume any suitable data wherever required but justify the same
5. Figures to the right indicate marks.

Q.1 Answer **any four** of the following **(20)**

(i) Show that the optimum conversion efficiency of the Class 'B' push pull amplifier is 78.5%

(ii) State the 'Barkhausen Criteria' of oscillation and explain how the oscillations build up in an oscillator.

(iii) State the significance of CMRR and slew rate parameters with reference to op-amp

(iv)What is crossover distortion in power amplifiers?

(v) What is the impact of cascading a CC stage at the input of a CE amplifier?

Q.2 (a) What are the different types of coupling used in BJT amplifiers? Draw the frequency response of BJT amplifiers and explain why the gain is dropping at low and high frequencies. **(07)**

(b) What is Darlington pair? What are its features? Derive the expression for voltage and current gain of an Darlington pair emitter follower circuit? **(08)**

(c) Write a short note on crystal oscillator. **(05)**

Q.3 Design a two stage RC coupled amplifier using BC147B transistors, with following specifications: **(20)**

Stage I voltage gain (Av1) = 100
Stage II voltage gain (Av1) = 50
Overall stability factor (S) <= 10
Lower Cutoff frequency (f_{low}) = 100 Hz

While designing, optimize the design for having high input impedance. Consider the loading effect of second stage on first stage. The specifications of BC147B are as given below:

h_{ie} = 4.5 Kohm $h_{FE\,typ}$ = 290
h_{oe} = 30 micromho h_{re} = 2×10^{-4}
$h_{fe\,typ}$ = 330 $h_{fe\,min}$ = 240

Q.4 (a) Draw the circuit diagram of a Dual Input Balanced Output differential amplifier and derive the relevant AC parameters for it. **(10)**

(b) Describe the following application of op-amp in short. **(10)**

(i)Non inverting DC amplifier with gain of 23

(ii)Summing amplifier

Q.5 (a)Draw the circuit diagram of integrator and differentiator using op-amp and derive the expressions for output voltages in both cases. **(10)**

(b) What are active filters? Explain the classifications of active filters with their frequency response curve. Design a first order low pass filter for a cutoff frequency of 1 kHz and passband gain of 4. **(10)**

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Q.6 (a) Design a class A transformer coupled amplifier with output power of 5 watts, load resistance of 4 ohms. Assume transformer efficiency of 80% and supply voltage of 12 volts. Use the transistor with following specifications **(15)**

P_{Dmax} (at 25°C)= 30 W; V_{CEO} = 40 Volts; I_{Cmax} (at 25°C) = 5Amps; V_{CEsat} = 1.0volt

(b) For the above design calculate the power dissipation in the transistor when delivering half the power output and also its efficiency. **(05)**

Q.7 (a) Compare the RC oscillators with LC oscillators. Describe in short Wien Bridge oscillator with the help of suitable schematic. **(10)**

(b) Draw the neat diagram of an UJT relaxation oscillator. Explain its operation. Derive the expression for frequency of output signal. Draw various waveforms. **(10)**