015402

May 2024

B. Tech. (ENC) (Fourth Semester)

Analog Electronics Circuits (ECP-402)

Time : 3 Hours]   [*Maximum Marks* : 75

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other. Assume relevant data/figure if found missing.

Part A

1. (a) Explain, why bridge rectifier is preferred over center tapped rectifier.   **1.5**

   (b) Compare reverse saturation current for CB, CE and CC configuration of BJT. Which configuration has maximum reverse saturation current and why ?   **1.5**

   (c) Why Q point (operating point) is fixed in the middle of active region of the transistor characteristics for a good voltage amplifier.   **1.5**

(d) What is the importance of threshold voltage in Enhancement Mode and Depletion Mode of MOSFET ? **1.5**

(e) Why the overall gain of multistage amplifier is always less than the product of gains of individual stage ? **1.5**

(f) Why a stepdown transformer is used in the output circuit of a power amplifiers ? **1.5**

(g) Why we use RC oscillators for audio frequency and LC oscillators for radio frequencies ? **1.5**

(h) What is meant by frequency response of a filter. Explain, why logarithmic scale is normally used for frequency and gain is taken in decibel. **1.5**

(i) What do you mean by slew rate and what are the reasons for a slew rate in operational amplifier ? **1.5**

(j) What is Schmitt trigger ? Why is hysteresis desirable in Schmitt trigger ? **1.5**

Part B

2. (a) Draw a full-wave rectifier using two diodes, the internal resistance of each diode may be assumed constant at 20 Ω. The transformer r.m.s. secondary voltage from centre tap to each end of secondary is 50 V and load resistance is 980 Ω.

Also find : **10**

   (i) the mean load current

   (ii) the r.m.s. value of load current

   (iii) rectification efficiency.

(b) Find output waveform for the following circuit considering ideal diode and peak value of input voltage is 20 V and $V_r = 5$ V. **5**

Input Waveform
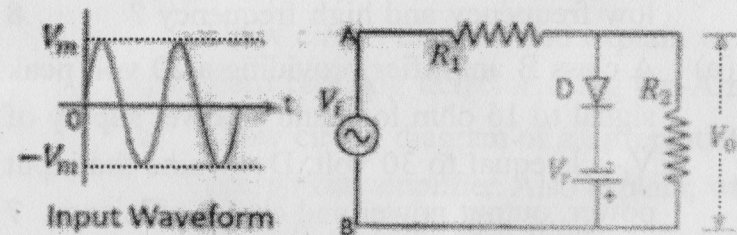
3. (a) What do you understand by hybrid parameters of a transistor ? Derive these parameters for a single stage amplifier and give their importance. **8**

(b) Following figure shows that a silicon transistor with $\beta = 100$ is biased by base resistor method. Draw the d.c. load line and determine the operating point. Also find its stability factor. **7**

$+V_{CC} = 6\,V$

$530\,k\Omega$ $2\,k\Omega$
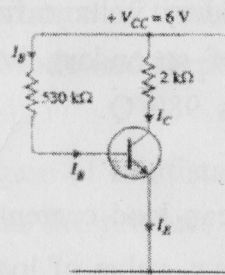
4. (a) Draw circuit diagram and explain working of two stage RC coupled common emitter amplifier and sketch its frequency response. What factors affect the gain of amplifier at low frequency and high frequency ? **8**

(b) A class B amplifier providing a 20 volt peak signal to 16 ohm load and a power supply of V_{CC} is equal to 30 volt. Determine the input power, output power and circuit efficiency. **7**

5. (a) Draw and explain working of a Wien bridge oscillator. Give the condition for sustained oscillation. Why is it mandatory that the minimum gain of the amplifier is equal to 3 ? **8**

(b) Draw the circuit diagram and explain the VI characteristics of JFET. Show that drain current in JFET does not depend upon the Drain voltage after pinch off. **7**

6. (a) Draw the circuit diagram of operational amplifier used as non-inverting amplifier and derive the expression for its voltage gain input resistance and output resistance. **10**

(b) An alternating current gain of a transistor operating in common base configuration is 0.98. Find the change in collector current corresponding to a change of 5.0 mA in emitter current. What would be the corresponding change in base current for the same current gain ? **5**

7. (a) What do you mean by zero crossing detector ? Draw circuit diagram and explain working of Zero crossing detector using Op-Amp. **8**

(b) Draw circuit diagram of a differentiator using operational amplifier. Also explain, why it can be used as high pass filter. **7**