B.Sc. Semester-III Examination, 2022-23

ELECTRONICS [Honours]

Course ID : 31711 Course Code : SH/ELC/301/C-5(T)

Course Title : Electronic Circuits

Time : 1 Hour 15 Minutes. Full Marks : 25

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **three** of the following questions: 1×3=3

   a) Draw the complete circuit diagram of Zener diode regulated power supply with proper labelling.

   b) What is an electronic filter? How many electronic filters are there?

   c) What is feedback in an amplifier? What are the effects of feedback in an amplifier?

   d) What is the maximum conversion efficiency of a class-B push-pull power amplifier? What is the significance of conversion efficiency?

   e) What are "Barkhausen Criterion" for the condition of oscillation?

   f) What is harmonic distortion in an amplifier circuit?

2. Answer any **three** of the following questions: 2×3=6

   a) Draw and explain DC or AC load-line for a transistor-based CE amplifier. 2

   b) What type of amplifiers are called power amplifiers? How are they classified into different categories? 1+1=2

   c) What is rectification efficiency of a rectifier? What is its maximum value for a full wave rectifier circuit? 1+1=2

   d) What do you mean by ripple? What are the magnitudes of ripple frequency in a half-wave and a full-wave rectifier? $\frac{1}{2}+1\frac{1}{2}=2$

   e) Derive the expression for ripple factor in case of a full wave rectifier. 2

   f) What are the basic differences between a voltage amplifier and a power amplifier? 2

3. Answer any **two** of the following questions: 5×2=10

   a) Draw the circuit diagram of a transistor-based R-C coupled amplifier (single stage) and its AC equivalent circuit in terms of hybrid parameter (h-parameter). Hence, obtain the expression for voltage gain in the mid-frequency range. 2+3=5

b) Draw the circuit diagram of a transistor-based self-biased (emitter-biased) circuit. How many power supplies are used here? For what particular properties the stability of this circuit increases? When a transistor can be used as a switch?

2+1+1+1=5

c) With proper circuit diagram, explain the working principle of a Hartley oscillator. Obtain the expression for generated frequency by this oscillator. Mention one application of it.

$1+2\frac{1}{2}+1\frac{1}{2}=5$

d) Draw the block diagram of a feedback amplifier. Obtain the expression for feedback gain– (i) without feedback condition and (ii) with feedback condition. Draw the frequency response curve of any amplifier– (i) without feedback condition and (ii) with feedback condition.

$2\frac{1}{2}+2\frac{1}{2}=5$

4. Answer any **one** of the following questions:

$6\times1=6$

a) With proper circuit diagram, explain how an AC signal is converted into DC by a bridge type full-wave rectifier. Show the input and output wave form of the rectifier. 4+2=6

b) With proper circuit diagram, obtain an expression for frequency of generated signal from an R-C phase-shift oscillator. What is the nature of frequency obtained from this oscillator?

2+3+1=6

c) Draw the structural circuit diagram of an n-channel depletion type MOSFET. Draw its drain characteristics for different values of gate to source voltage and hence draw its transfer characteristics. Sketch its circuit symbol. What is CMOS? 1+3+1+1=6

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