Ref : Ex/PRN/IEE/T/126/2019(Old)

B.E. PRINTING ENGINEERING, 1ST YEAR, 2nd SEMESTER (OLD) – 2019

Subject : ELECTRONICS **Time : Three Hours** **Full Marks : 100**

Instructions : 1) This paper contains **eight** questions and an **APPENDIX**. Answer any **five** questions
2) Answers of sub-questions of any question to be written in **one place**. Do not be haphazard.
3) Write 'Answer' beside the final answer of numerical problem.
4) Justified marks will be given for neat presentation.

Q1. a) **Draw** Circuit diagram of a Bridge rectifier (4 diodes) and explain its' action with a sinusoidal AC I/P voltage. (4+4)

b) Draw circuit diagram of Regulated DC power supply consisting a bridge rectifier , a capacitor filter, a Zener diode and a load resistance. Also graphically show its' O/P at various points with a sinusoidal I/P voltage. (5+4)

c) An amplifier has O/P power of 1.5W with I/P power 10 mW at 2 kHz and O/P power of 0.3W with same I/P power at 20Hz. Calculate the rise or fall in dB power gain. (3)

Q2. **a)** What is the advantage of RC coupled amplifier over Transformer coupled amplifier ? What is the advantage of Transformer coupled over RC coupled ? (1+1)

b) Define f_T frequency of transistor. State gain-bandwidth principle of transistor amplifier. (2+2)

c) What is Q-point? Where do you locate Q-point on load line for best operation of a properly designed amplifier and why ? (5+5)

d) Determine db Power gain of an amplifier with 59% amplification. (4)

Q3. **a)** Why common emitter (CE) configuration more useful than common base (CB) configuration of transistor ? Draw I/P and O/P characteristic curves of a transistor for (1) CE configuration and (2) CB configuration. Also define I/P and O/P resistances of transistor from these curves for both CE and CB. (2+2x2+2x2+2x2)

b) Define α and β parameters of transistor. Hence deduce the relation: $\frac{I_E}{1} = \frac{I_B}{1-\alpha} = \frac{I_C}{\alpha}$. Calculate the value of β for α = 0.96. (2+3+1)

Q4. **a)** A Si-diode (r_f=10Ω, V_b=0.7V) is operated by an AC source of 50Hz, V_{rms}=14.14V in series with a load resistance 500Ω. Draw the circuit. Calculate peak current and peak O/P voltage. What will be these values if the diode be an ideal one ? (2+2x2+2x2)

b) Define rectification efficiency of a rectifier. Deduce an expression for the same of a half wave rectifier in terms of circuit parameters. What is its' maximum possible value ? (2+6+2)

Q5. a) Define dB Power gain and dB Voltage gain. Why do we prefer to express gain in dB-scale rather than by its' absolute value ? **(1+1+3)**

b) Draw frequency response curve of an audio frequency amplifier showing lower cut-off frequency (f_1) and upper cut-off frequency (f_2). Hence define f_1 and f_2. What are the approximate values of f_1 and f_2 for an audio amplifier ? **(2+1x2+2)**

c) Show that the difference in dB-scale between maximum gain and gain at f_1 and f_2 is 3dB **(3)**

d) Explain briefly why frequency response curve, as referred in Q(b), bends downward at lower frequency as well as at higher frequency range. **(6)**

Q6. a) Draw a **Positive** Clipper circuit using a real Si-diode. Explain its' action for an I/P voltage signal : $V=V_m \sin\omega t$. Draw the O/P wave form. **(3+6+1)**

b) Draw the Circuit diagram of a Combination Clipper showing sketches of I/P and O/P of wave forms (No descriptions). **(3+1)**

c) How do you use a Clipper Circuit to estimate 'turn on voltage' (barrier potential)of a real diode ? —describe briefly. You may be provided with a CRO. **(6)**

Q7. a) Draw a simple voltage stabilizer circuit using an ideal Zener-diode, a series resistance and a load. Describe the variation of I_Z when (i) I/P voltage varies but load is constant, and (ii) I/P voltage is constant but load varies. (Consider Zener to be ON during the process) **(3+4+4)**

b) Draw RB-Characteristic curves of Zener diode and Avalanche Photo-diode on separate axes. State (in tabular form) four distinct features of Zener diode and Avalanche diode. **(2x1+4x1)**

c) Check the status of Zener in Fig-I of **APPENDIX** (ON or OFF) and find the current through 3kΩ resistor. **(1+2)**

Q8. a) Define % Regulation (R) and Stabilization factor (S). A voltage Stabilizer Circuit consists of a series resistor R_S , a Zener diode of resistance r_Z and a load R_L . Draw the circuit. Establish a relation of 'S' with these resistances. Hence express 'S' in its' simplest form. What is your final conclusion ? **(2+2+5+2)**

b) If for a Voltage Stabilizer, R_S = 1kΩ, r_Z = 5Ω and I/P varies by ±0.5V about a mean value, what is the variation of O/P voltage ? **(3)**

c) Copy the Zener Circuit of fig-II of **APPENDIX.** Determine the range of R_L that will result a constant voltage of 10V across R_L. Consider Zener as ideal with maximum Power rating of 320mW. **(6)**

APPENDIX

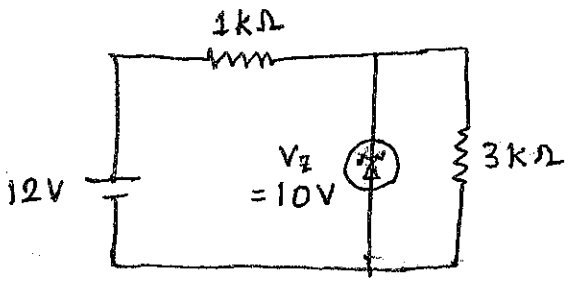

Fig- I

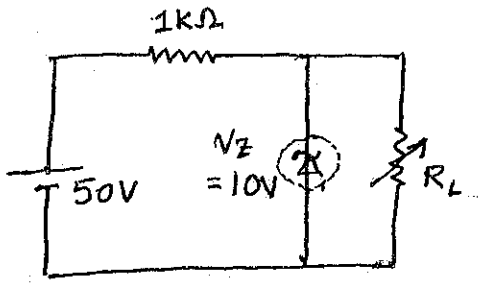

Fig- II