

ELECTRONIC DEVICES & CIRCUITS

Time Allowed: 3 Hours

Full Marks: 60

Answer the following questions from Group-A, B & C as directed.

Group A

- I. Choose the correct answer from the alternatives (any ten): 1 x 10
- i) I_{CEO} in a transistor is mainly due to –
a) majority carriers b) minority carriers c) both of a and b d) none of these
 - ii) Commonly used pentavalent material is –
a) Arsenic ~~b) Boron~~ c) Neon d) Gallium
 - iii) The highest cross-over distortion is observed in–
a) Class A amplifier ~~b) Class B amplifier~~ c) Class AB amplifier d) Class C amplifier
 - iv) The stability factor and change in I_C from 25°C to 100°C for, $\beta = 50$, $R_B/R_E = 250$, $\Delta I_{CO} = 19.9$ nA for emitter bias configuration are –
~~a) 42.53, 0.85 μA~~ b) 40.91, 0.58 μA c) 41.10, 0.39 μA d) none of these
 - v) Which type of feedback is used by Hartley oscillator? a) Voltage series feedback b) Current series feedback ~~c) Voltage shunt feedback~~ d) Current shunt feedback
 - vi) In a class B amplifier, it is found that DC power is 25W, find the ac power.
a) 10 W ~~b) 62.5 W~~ c) 25 W d) 50 W
 - vii) In a JFET drain current is maximum when V_{GS} is – ~~a) zero~~ (b) negative (c) positive
 - viii) Base layer is– A) heavily doped ~~B) lightly doped~~ C) moderately doped D) None
 - ix) In a feedback amplifier, sensitivity D is equal to –
a) $A\beta$ b) $1 - A\beta$ ~~c) $1 + A\beta$~~ d) $1/(A\beta + 1)$
 - x) Commercial power supplies have voltage regulation-
(a) of 10% (b) of 15% (c) of 25% ~~(d) within 1%~~
 - xi) The valence electrons of any semiconductor material are -
(a) 3 or 5 (b) 8 (c) 6 ~~(d) 4~~
 - xii) In a bridge rectifier circuit the RMS value of input ac voltage is 10 V. The PIV across each diode is– a) 7.07 V ~~b) 14.14 V~~ c) 10 V d) 28.28 V
 - xiii) What is a square wave generator?
a) Flip-flop b) Bi-stable multivibrator ~~c) Astable multivibrator~~ d) Monostable multivibrator
 - xiv) In a push- pull circuit – a) each transistor conducts for 180° b) each transistor conducts for more than 180° but less than 360° ~~c) each transistor conducts for less than 180°~~ d) the period of conduction of each transistor depends on circuit configuration.
 - xv) The open loop gain of an amplifier is 200. If negative feedback with $\beta = 0.2$ is used, the closed loop gain will be– a) 200 b) 40.12 ~~c) 4.878~~ d) 2.2

2. Fill in the blanks (any ten):

- i) A zener diode is used as _____.
- ii) In CB mode the current gain is _____.
- iii) The RMS voltage of a full-wave centre tap rectifier is _____.
- iv) The VVR stands for _____.
- v) The ripple factor of a full-wave rectifier is _____.
- vi) The value of peak factor for full-wave rectifier is _____.
- vii) A clamper is also known as a _____.
- viii) Oscillators operate on the principle of _____.
- ix) The transfer curve can be obtained by _____.
- x) In a UJT relaxation oscillator, the value of R_{BB} is $5\text{ k}\Omega$ and stand-off ratio is 0.6 at $I_E = 0$. The value of R_{B2} is _____.
- xi) _____ are used to select a portion of the input wave which lies below or above of reference levels.
- xii) In an FET transistor, the depletion region is _____ near the top of both p-type materials.
- xiii) Positive feedback results in _____.
- xiv) _____ is a semiconductor device which depends for its operation on the control of current by an electric field.
- xv) The value of α is less than _____. <https://www.wbsctonline.com>

3. Answer the following questions (any ten):

1x10

- i) What is diode?
- ii) What is insulator?
- iii) How many terminals are in transistor?
- iv) Define Semiconductor.
- v) Define load line.
- vi) What are the disadvantages of Field Effect Transistors?
- vii) Which transistor offers the highest speed?
- viii) What is the energy gap of silicon?
- ix) What is a Clipper?
- x) What do you mean by Cascading Amplifiers?
- xi) Write one application of rectifier
- xii) Write the relationship between α , β and γ .
- xiii) Write down the value of voltage gain of CE mode in terms of h parameter
- xiv) What is the formula of voltage gain in a power amplifier?

Group B

4. Answer the following questions (any six):

2x6

- i) Draw the symbols of JFET AND MOSFET
- ii) What is transistor biasing?
- iii) What are the classifications of Tuned amplifier?
- iv) Draw the equivalent circuit of diode.
- v) What is crossover distortion?
- vi) Draw the block diagram of amplifier circuit using h-parameter.
- vii) Why the base of the transistor is heavily doped?
- viii) What are the differences of AC load line & DC load line?
- ix) What are the differences between avalanche breakdown and zener breakdown?
- x) What are barkhausen criteria?
- xi) What is the advantage of bridge rectifier over full wave centre tapped rectifier?
- xii) What are the applications of op-amp?

Group C

5. Answer the following question (any one):

1x6

- a) Draw the circuit diagram and necessary wave diagram of full wave bridge rectifier. Calculate its average output voltage.
- b) Derive the expressions of γ and η in terms of measurable/supplied quantities.
- c) For a full wave rectifier calculate a) ripple factor b) rectifier efficiency considering sinusoidal wave.

6. Answer the following question (any one):

1x6

- a) Explain the operation of depletion type n - channel MOSFET and draw its drain and transfer characteristics.
- b) Distinguish between a voltage amplifier and a power amplifier. Classify power amplifier. Write advantages of Class B push-pull amplifier.
- c) Derive the expression for voltage gain for a FET amplifier. Write down Schokley's equation and derive the expression for transconductance.

7. Answer the following question (any one):

1x6

- a) Compare the characteristics of Class A, Class B & Class C power amplifier. Explain the emitter follower circuit in brief.
 - b) Explain the operation of push pull amplifier.
 - c) Explain how voltage series feedback impacts on the input and output impedances of a feedback amplifier.
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