Serial No. G.....

To be filled in by the candidate

..... Year/Semester Examinations, 20.....

Subject _____

Name of the Paper _____

No. of additional sheets (if any) :-

For Objective Type Questions	
Page No.	**Marks**

For Descriptive Type Questions	
Page No.	**Marks**

Date Stamp.....

Objective
Booklet A.....

To be filled in by the candidate

_____Year/Semester

EXAMINATIONS 20.....

ROLL NO. _____

REGD. NO. _____

SUBJECT _____

PAPER/COURSE NO. : _____

No. of addl. sheets (if any) :-

Instructions to candidate

Please read this instructions carefully before you start writing your answers.

1. This answerbook has 28 pages. Please check before writing whether the book is complete and in good condition.
2. Please furnish all the details asked for at the space provided in the main answer book and the additional answer book , if any. Writing this details anywhere else on the answer book will invalidate your examination.
3. Do not write your name or the name of your College / Institutions anywhere or anything else, which is not a part of your answer.
4. Write legibly on both sides of the paper. Strating from Page No. 1
5. You may use some space for your rough notes or calculations on the a nswer book if you so desire. These rough notes, calculations must be scored out before submitting the answer book.
6. Do not bring any book or loose paper in the examination hall.
7. Do not tear any page from the Answer Book.
8. Do not write anything on the question paper or blotting paper or any pieces of paper while you are in the examination hall.
9. Any act of indiscipline or misbehaviour in the examination hall will result in your expulsion.
10. No examinee is allowed to leave the examination hall until 30 (thirty) minutes lapse after the commencement of the examination.
11. Additional answer sheet will be supplied after the main answer book is exhausted.
12. Use of cell phone, calculator or any electronic devises in the examination hall is strictly prohibited unless specified in the Question Paper.

Scrutinizer's Signature **Examiner's Signature** **Invigilator's Signature**

2020
(CBCS)
(SECOND SEMESTER)
ELECTRONICS
(Semiconductor Physics)
Full Marks: 50
Time: 3 hours

Instructions:

1. Questions should be attempted as per instructions.
2. Do not copy the Questions. Indicate the Questions No. clearly while attempting the answer.
3. Multiple choice answer should indicate the Question No., Sub. No., (if any) and the correct answer. For example-
   1. *Name the state capital of Mizoram.*
   (a) Lunglei (b) Aizawl (c) Champhai
   Candidate should provide answer as **Q. No. 1: (b) Aizawl**
   [Candidate should avoid writing only (b)]
4. The figures in the margin indicate full marks for the questions.
5. Separate answer script should be used.

(SECOND : A – OBJECTIVE)

(*Marks* : 10)

Choose the correct answer from the following questions: 1×10=10

1. Addition of impurity to a pure semiconductor is called
(a) rectification
(b) drift current
(c) doping
(d) extrinsic semiconductor

2. The depletion region of a semiconductor diode is due to
(a) reverse biasing
(b) forward biasing
(c) absence of current carriers
(d) crystal doping

3. The ripple factor of a full-wave rectifier is
(a) 2
(b) 1.21
(c) 2.5
(d) 0.48

4. The filter circuit results in the best voltage regulation is
(a) choke input filter
(b) capacitor filter
(c) resistance input filter
(d) π-filter

5. When used in a circuit, Zener diode is always
(a) forward biased
(b) connected in series
(c) reverse biased
(d) troubled by overheating

6. A semiconductor which operates with a forward biased metal-semiconductor junction is called
(a) Schottky diode
(b) Tunnel diode
(c) Varactor diode
(d) PIN diode

7. The operating point of a transistor is also called
(a) quiescent point
(b) cut-off point
(c) saturation point
(d) intersection point

8. Thermal runaway occurs when
(a) collector is reverse biased
(b) transistor is not biased
(c) emitter is forward biased
(d) junction capacitance is high

9. The point of intersection of d.c. and a.c. load lines is called
(a) saturation point
(b) cut-off point
(c) operating point
(d) check point

10. The d.c. load line of a transistor circuit
(a) has a negative slope
(b) is a curved line
(c) gives graphic relation between I_C and I_B
(d) does not contain the Q-point

(SECTION:B- SHORT NOTES)

(Marks :10)

Answer *any four* of the following questions : 2½×4 = 10

1. Explain the formation of depletion region in a *p-n* junction.

OR

Give the electronic distribution of copper having atomic number 29.

2. What do you understand by the d.c. and a.c. resistance of a crystal diode? How will you determine them from the *V-I* characteristic of a crystal diode?

OR

A crystal diode having internal resistance r_f= 20Ω is used for half-wave rectification. If the applied voltage $V = 50 \sin \omega t$ and load resistance R_L = 800Ω., find the efficiency of rectification.

3. Explain the *V-I* characteristics of Tunnel diode.

OR

Explain how Zener diode can be used as a peak clipper.

4. What is thermal runaway? How will you avoid this in a transistor?

OR

Show that $\beta = \frac{\alpha}{1-\alpha}$, where the symbols have their usual meanings in a transistor.

5. Explain bandwidth of an Amplifier with necessary diagram.

OR

Write down the steps for construction of d.c. load line.

(SECTION: C – DESCRIPTIVE)

(Marks: 30)

The questions are of equal values

Answer any *three* of the following questions: 10×3 = 30

1. (a) Describe with a diagram, the atomic model proposed by Niels Bohr. What do you mean by valence electrons?

(b) What is energy band? Classify solids in terms of energy bands.

(c) Determine the electronic distribution of xenon atom having Z = 54.

OR

(a) Explain the reverse *V-I* characteristics of a junction diode. What are the differences between zener and avalanche breakdowns?

(b) What do you mean by doping in semiconductor physics? Write down the formation of *n*-type extrinsic semiconductor.

2. (a) Explain with a diagram, how semiconductor diode can be used as a full-wave rectifier. Show that its maximum efficiency is 81.2%.

(b) Explain Approximate Equivalent circuit of semiconductor diode.

(c) Describe the filtering action of choke input filter.

OR

(a) What is ripple factor? Show that the value of ripple factor for half-wave rectifier is 1.21. Explain with a diagram, how semiconductor diode can be used as a half-wave rectifier.

(b) Explain Simplified Equivalent circuit of semiconductor diode.

(c) Describe the filtering action of π-filter.

3. (a) Explain the operation and characteristics of Photo-diode.

(b) Describe the construction, operation and applications of Schottky diode.

(c) What is Zener diode? Explain how Zener diode maintains constant voltage across the load.

OR

(a) Describe the construction and resistance curve of thermistor.

(b) What is photo-diode? How is current reduced to zero in photo-diode?

(c) What is Shockley diode? Explain its working.

4. (a) Discuss the working of *p-n-p* transistor with diagram.

(b) Explain with a diagram, the input characteristics of a CE transistor. State the advantages of a CE mode over other mode of operations

(c) What is meant by transistor biasing? What are the important biasing rules?

OR

(a) Explain with diagram, the input and output characteristics of CB configuration in an *n-p-n* transistor.

(b) Explain with diagram, the leakage current in CE circuit of a transistor.

(c) Show that $I_E = (1 + \beta) I_B$

5. (a) Derive an expression for voltage gain of a transistor amplifier from its a.c. equivalent circuit.

(b) Explain in brief the frequency response curve of an amplifier. What do you mean by resonant frequency?

(c) What do you mean by power gain? Explain how transistor amplifies.

OR

(a) Describe class – A, class – B, class – C, and class – AB amplifiers.

(b) Differentiate between Input resistance and Output resistance.

(c) What is a linear amplifier? Explain quiescent point of a transistor amplifier with suitable diagram showing cut-off and saturation.

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