III/ **ELEC (iii)**

2 0 1 6

(3rd Semester)

ELECTRONICS

THIRD PAPER

(Electronic Devices and Amplifiers)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. *(a)* Write four applications of FET. 2

   (b) Explain the construction and working of enhancement type MOSFET. 5

   Or

   (c) Write the difference between shorted-gate drain current (I_{DSS}) and gate-source cut off voltage $V_{GS(off)}$. 2

   (d) A JFET has a drain current of 5 mA. If I_{DSS} 10 mA and $V_{GS(off)}$ 6V, find the value of *(i)* V_{GS} and *(ii)* V_P. 2

   (e) Explain the output characteristics of JFET. 3

(2)

2. *(a)* Explain the UJT used as relaxation oscillator. 3

   (b) Explain the working of UJT from equivalent circuit. Write the two applications of UJT. 3+1=4

   Or

   (c) Derive the efficiency and ripple factor of a half-wave rectifier. 3

   (d) Explain the construction and operation for SCR. 4

3. *(a)* What is the characteristics of a Zener diode that made it possible for use in voltage regulation? 2

   (b) Write down the theory and construction of light-emitting diode (LED). 3+2=5

   Or

   (c) Discuss the typical *V–I* characteristics of a solar cell. 2

   (d) With a neat diagram, explain the construction and working of a *p–n* junction photodiode. 2+3=5

(3)

4. *(a)* Mention some special characteristics that distinguish a tuned amplifier from other amplifiers. 2

(b) With a neat diagram, explain the working of single-tuned amplifier. Discuss its frequency response. 3+2=5

Or

(c) Classify amplifier based on biasing condition. Draw a graphical representation of class–A amplifier and locate its Q point. 3+1=4

(d) Show that the efficiency of transformer coupled class–A amplifier is 50% in an ideal case. 3

5. *(a)* A differential amplifier has an open-circuit voltage gain of 100. The input signals are 3·25 V and 3·15 V. Determine the output voltage. 2

(b) What are the differential amplifiers? With circuit diagram, explain the operation of differential amplifier. 1+4=5

(4)

Or

(c) Derive the expression for common-mode voltage gain of differential amplifier. 3

(d) A differential amplifier has an open-circuit voltage gain of 100. This amplifier has a common input signal of 3·2 V to both terminals. This results in an output signal of 26 mV. Determine *(i)* common-mode voltage gain and *(ii)* the CMRR in dB. 2+2=4

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Subject Code : III/ELEC (iii)   **Booklet No. A**

Date Stamp ....

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To be filled in by the Candidate

DEGREE 3rd Semester
(Arts / Science / Commerce /
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Subject ....

Paper ....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**

2. **This paper should be ANSWERED FIRST and submitted within** *45 minutes* **of the commencement of the Examination.**

3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 3rd Semester

(Arts / Science / Commerce /

......................) Exam., **2016**

Roll No. ....

Regn. No. ....

Subject ....

Paper ....

Descriptive Type

Booklet No. B ....

Signature of
Scrutiniser(s)

Signature of
Examiner(s)

Signature of
Invigilator(s)

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2 0 1 6

(3rd Semester)

ELECTRONICS

THIRD PAPER

(Electronic Devices and Amplifiers)

(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 5)

Put a Tick (✓) mark against the correct answer in the brackets provided :   1×5=5

1. In a JFET operating above pinch-off voltage, the drain current

   (a) starts decreasing   (   )

   (b) increases steeply   (   )

   (c) disappears   (   )

   (d) remains practically constant   (   )

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2. SCR is a device having

   (a) three layers   (   )

   (b) three transistors   (   )

   (c) four layers   (   )

   (d) two diodes   (   )

3. For the reference sample in controlled series transistor regulator, we use

   (a) Zener diode   (   )

   (b) variable resistor   (   )

   (c) resistor   (   )

   (d) transistor   (   )

4. The maximum collector efficiency of class–B operation is

   (a) 50%   (   )

   (b) 60·5%   (   )

   (c) 90%   (   )

   (d) 78·5%   (   )

5. Open-loop gain of an OP-AMP is the gain obtained when

   (a) high feedback in the circuit   (   )

   (b) no feedback in the circuit   (   )

   (c) negative feedback in the circuit   (   )

   (d) positive feedback in the circuit   (   )

SECTION—II

(*Marks* : 15)

Answer any *five* questions of the following :   3×5=15

1. Explain the forward and reverse *V–I* characteristics of a *p–n* junction diode.

2. The following readings were obtained experimentally from a JFET :

V_{GS}	0 V	0 V	–0·2 V
V_{DS}	7 V	15 V	15 V
I_D	10 mA	10·25 mA	9·65 mA

Determine *(i)* a.c. drain resistance, *(ii)* transconductance and *(iii)* amplification factor.

3. Explain 90° phase control of an SCR.

4. Define the cross-over distortion in class–B push-pull amplifier.

5. What are the important points that need consideration in using transformer coupled class–A amplifier? Write the importance of blocking capacitor in class–A power amplifier.

6. Explain how Zener diode can be used for voltage peak clipper.

7. What are the advantages of inserting an intrinsic layer in a *p–n* junction diode to form a PIN diode?

8. Draw a block diagram of typical OP–AMP and explain the function of each block.

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