

ASSIGNMENT BOOKLET
Bachelor's Degree Programme (B.Sc.)

ELECTRICAL CIRCUITS AND ELECTRONICS

Valid from January 1, 2021 to December 31, 2021

**It is compulsory to submit the Assignment before filling up the
Term-End Examination Form.**

Please Note

- You can take electives (56 to 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.
- You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.
- At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 64 credits of electives in these 3 disciplines, at least 16 credits should be from lab courses.
- You cannot appear in the Term-End Examination of any course without registering for the course. Otherwise, your result will not be declared and the responsibility will be on you.



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2021

Dear Student,

We hope you are familiar with the system of evaluation to be followed for the Bachelor's Degree Programme. At this stage you may probably like to re-read the section on assignments in the Programme Guide for Elective Courses that we sent you after your enrolment. A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation which would consist of one tutor-marked assignment (TMA) for this course. Submit your assignment response at your Study Centre.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully:

- 1) On top of the first page of your **TMA** answer sheet, please write the details exactly in the following format:

ENROLMENT NO. :

NAME :

ADDRESS :

.....

.....

COURSE CODE :

COURSE TITLE :

ASSIGNMENT CODE :

STUDY CENTRE : DATE :

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise and in your own words. Do not copy answers from study material.
- 5) While solving problems, clearly indicate the question number along with the part being solved. Write units at each step of your calculations as done in the text because marks will be deducted for such mistakes. Take care of significant digits in your work. Recheck your work before submitting it.
- 6) **This assignment will remain valid from January 1, 2021 to December 31, 2021.** However, you are advised to submit it within **12 weeks** of receiving this booklet to accomplish its purpose as a teaching-tool.

Answer sheets received after the due date shall not be accepted.

We strongly feel that you should retain a copy of your assignment response to avoid any unforeseen situation and append, if possible, a photocopy of this booklet with your response.

You could obtain response to the difficulties you may face in PHE-10 course via e-mail by writing to **sgokhale@ignou.ac.in**. Please note that, we do not provide answers to Assignment questions.

We wish you good luck.

Tutor Marked Assignment ELECTRICAL CIRCUITS AND ELECTRONICS

Course Code: PHE-10
Assignment Code: PHE-10/TMA/2021
Max. Marks: 100

Note: Attempt all questions. Symbols have their usual meanings. The marks for each question are indicated against it.

1. State, **with reasons**, whether the following statements are True or False. (2×10)
- i) Ideal current source has zero internal resistance.
 - ii) Suppressor grid in pentode is kept at anode potential.
 - iii) Bipolar junction transistor (BJT) is a voltage controlled device.
 - iv) Highest current gain is obtained in common base configuration of an amplifier.
 - v) Ripple factor of a center tapped full wave rectifier is greater than that of a bridge rectifier, which uses four diodes.
 - vi) When same voltage is applied to both the inputs of an op-amp the output voltage is infinite.
 - vii) IC LM317 is a small signal amplifier used to amplify audio frequency voltage.
 - viii) Largest decimal number represented by a 3-digit hex number is 999.
 - ix) All the logic gates can be realized using combination of only OR and NOT gates.
 - x) In a CRO sweep generator output is given to the vertical deflection plates.
2. a) Find the Thevenin equivalent for the circuit shown in Fig. 1 between terminals *a* and *b*. Calculate the current in and the voltage across the load resistance R_L . (5)

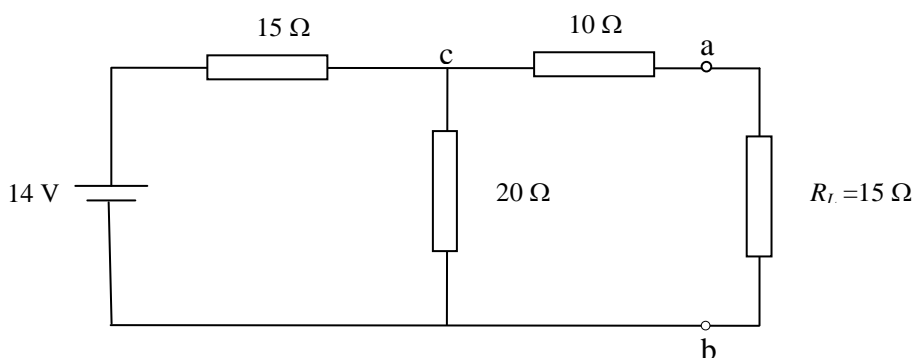


Fig. 1

- b) Bandwidth of an RLC series circuit is 100 kHz. If the value of L is 0.1 mH then determine the values of R and C in order to make Q of this circuit equal to 5. (5)
3. a) State the biasing conditions for $E-B$ and $C-B$ junctions in a BJT for its proper operation. Explain the output characteristics of a CE configuration of an amplifier. (1+4)
- b) Explain the effect of doping on the energy band diagram of a semiconductor. (5)
4. a) Why is it necessary in the case of cascade amplifier to use coupling network between the two stages? What are the advantages of transformer coupling? (2+3)

- b) On the basis of their biasing, with the help of appropriate diagrams, justify the uses of Class A, AB and C amplifiers for various applications. (5)
5. a) State the Barkhausen criterion for sustained oscillation. Explain the operation of Colpitts oscillator. A Colpitts oscillator oscillates with frequency 10 MHz, determine the equivalent capacitance, C forming tank circuit with 0.1 mH inductor. (1+2+2)
- b) The turns ratio of a transformer used in half wave rectifier is 20:1. The primary is connected to the power mains: 220 V, 50 Hz. If the diode resistance in forward bias is 20Ω and the load resistance, R_L is 500Ω , determine
- the peak value, the dc value and the rms value of current;
 - the ripple factor; and
 - the rectification efficiency. (3+1+1)
6. a) You want to amplify an input signal with 10 mV amplitude and 50 MHz frequency. Which characteristics of op-amp will be significant in this case? What will be the value of these parameters? Why? (2+2+2)
- b) Design and draw a circuit using an op-amp to get + 8 V at output for input less than +4 V and -8 V at output for input greater than +4 V. (4)
7. a) For Fig. 9.4 of your study material, the formula for feedback loop gain is

$$A_{v_{cl}} = \frac{-A_v}{1 - \frac{A_v}{1 + (R_2 / R_1)}}$$

where A_v is the fixed gain of IC380. Design and draw the circuit using IC380 to obtain the gain of 100. (5)

- b) Design a regulated power supply using LM 337 to provide -20 V output. (5)
8. a) Convert binary number 110011101_2 to its BCD code. (3)
- b) Divide 1010001_2 by 1001_2 . (2)
- c) Design and draw a Mod-9 counter. (5)
9. a) Design a half adder using only NAND gates. (5)
- b) Design a circuit of basic function generator to generate a triangular wave of 1 kHz frequency and ± 10 V amplitude. (5)
