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PHE-10

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

ELECTRICAL CIRCUITS AND ELECTRONICS

Valid from January 1, 2024 to December 31, 2024

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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THE PEOPLE'S UNIVERSITY

School of Sciences
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Maidan Garhi, New Delhi-110068

2024

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 : ………………………………………

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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, 2024 to December 31, 2024.** 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/2024
Max. Marks: 100

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

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1. State, **with reasons**, whether the following statements are True or False: (2×10)

   i) Kirchoff's voltage law is valid only for passive element circuits.

   ii) In a series resonant circuit, minimum current flows at resonance frequency.

   iii) Higher form factor implies better rectification efficiency.

   iv) Class *A* amplifier provides distortion free operation at the cost of efficiency.

   v) *LC* oscillators are not preferred for generating low frequencies.

   vi) Operational amplifier is the only type of amplifier available in IC form.

   vii) In a regulator IC, the head room should be as large as possible.

   viii) It is possible to build any gate using combination of only OR gates.

   ix) *D*-latch uses edge triggering.

   x) Mod-7 counter requires 4 flip-flops.

2. a) Using superposition principle obtain the current flowing through load resistor R_L in the circuit shown in Fig. 1. (6)

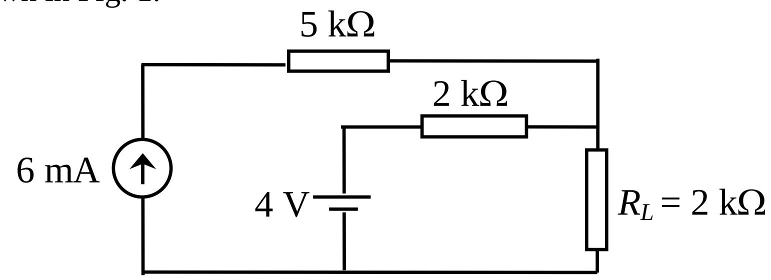

Fig. 1

   b) Explain the different between a FET and MOSFET on the basis of their construction and working. (4)

3. Design a basic band pass filter comprising of a series combination of a T-section high pass filter and a T-section low pass filter to pass the frequencies between 10 kHz and 100 kHz. Take K = 100 for HPF and K = 400 for LPF. (10)

4. Design a universal bias for a class-*A* CE-amplifier (Fig. 4.11c of your study material) using NPN transistor for the following parameter values: V_{CC} = 20 V, V_B = 4 V, I_C = 10 mA, V_{BE} = 0.6V, V_{CE} = 10 V and β = 100. Obtain the values of R_C, R_E, R_1 and R_2. (10)

5. a) Explain the process of generating oscillations in a Wein bridge oscillator. (5)

   b) Design a zener regulator to give regulated 10 V dc output with maximum load current of 100 mA. Consider that input unregulated dc supply is 15 V and $I_{z(min)}$ = 1 mA. Write down the voltage and power ratings of the zener diode and power rating of series resistor R_S for your circuit. (5)

6. a) A triangular wave of ± 12 V amplitude and 10 MHz frequency is generated at the output of an op-amp. Calculate the minimum slew rate of the op-amp used. (5)

   b) Design an adjustable voltage regulator to give 6 to 12 V dc using IC LM 317. (5)

7. a) Design a 3-channel op-amp based circuit to give following output relation:

$$V_O = 7V_1 - 5V_2 + 10\frac{dV_3}{dt}$$ (10)

8. a) Convert 732.52_{10} into its octal equivalent. (5)

   b) Implement half adder using NAND gates. (5)

9. Design a 5-bit DAC using op-amp adder. Specify the minimum op-amp supply voltage required for proper operation. Calculate the step size for digital input of 0-5 V. What is % resolution of the DAC? (10)

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