



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## MODEL QUESTION PAPER

B.Tech III Semester End Examinations (Regular), November – 2018

Regulation: IARE-R16

### BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to AE / CE / ME)

**Time: 3 hours**

**Max. Marks: 70**

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

#### UNIT – I

1. a) State Kirchhoff's voltage law and Kirchhoff's current law. Make short notes on practical sources and ideal sources. [7M]
- b) Determine the value of the source current for the circuits shown in the Figure 1, using delta star transformation. [7M]

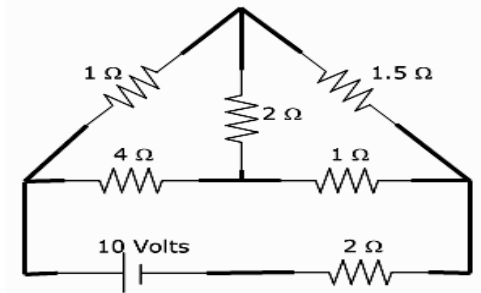


Figure 1

2. a) Calculate the power delivered by the source in the circuit as shown in the Figure 2. [7M]

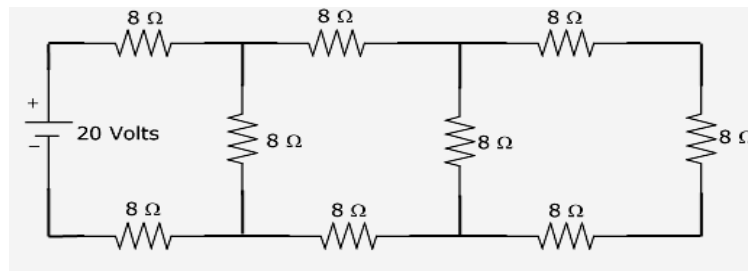


Figure 2

- b) Demonstrate the principle of operation of permanent magnet moving coil instrument and moving iron instruments. [7M]

## UNIT – II

3. a) Explain the principle of operation of DC motor. Derive the torque equation of DC motor. [7M]
- b) Determine the developed torque and shaft torque of 220V, 4 pole DC series motor with 800 conductors wave connected, supplying a load of 10 kW by taking 50A from the mains. The flux per pole is 20mWb and its armature circuit resistance is  $0.8\Omega$ . [7M]
4. a) Describe the constructional features of DC machine. Explain the process of commutation in DC machines. [7M]
- b) A 6 pole DC generator runs at 850 rpm and each pole has a flux of 12mWb. Determine the generated emf, if there are 150 conductors in series between each pair of brushes. [7M]

## UNIT – III

5. a) Demonstrate the working principle of a single phase transformer? Explain with the help of a neat sketch. [7M]
- b) A transformer supplied a load of 32A at 415V. If the primary voltage is 3320V, determine the primary current, primary volt ampere, secondary volt amperes. Neglect losses and magnetizing current. [7M]
6. a) Explain the working principle of induction motor. Derive the expression for torque developed in induction motors. [7M]
- b) A 6-pole, 50Hz squirrel cage induction motor runs on load at a shaft speed of 970 rpm. Calculate the slip and frequency of induced current in the rotor. [7M]

## UNIT – IV

7. a) Discuss the following diode parameters: [7M]  
i) PIV ii) Dynamic resistance iii) Static resistance iv) Cut in voltage v) Reverse saturation current vi) Reverse breakdown voltage.
- b) Explain the working principle of a half wave rectifier with neat circuit diagram and related wave forms. Compute the output equations. [7M]
8. a) Describe the VI characteristics of Zener diode and give its application as voltage regulator. [7M]
- b) The i/p to the full wave rectifier is  $v(t) = 200\sin 50t$ . If  $R_L$  is  $1k\Omega$  and forward resistance of diode is  $50\Omega$ , calculate: [7M]  
i) DC current through the circuit ii) The AC (rms) value of current through the circuit iii) The DC output voltage iv) The AC power input v) The DC power output vi) Rectifier efficiency.

## UNIT – V

9. a) Describe the functioning of BJT in common base configuration with the help of its input and output characteristics. [7M]
- b) Estimate the values of  $I_C$  and  $I_E$  for a transistor with  $\alpha_{dc} = 0.99$  and  $I_{CBO} = 5\mu A$ , if  $I_B$  is measured as  $20\mu A$ . [7M]

10. a) Summarize the common emitter circuit and sketch the input and output characteristics. Also explain active region, cutoff region and saturation region by indicating them on the characteristic curves. [7M]
- b) Compute the values of  $\alpha$ ,  $I_E$  and  $I_C$  in a common emitter transistor circuit if  $\beta = 100$  and  $I_B = 50\mu\text{A}$ . [7M]



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## COURSE OBJECTIVES:

The course should enable the students to:

I	Understand Kirchhoff laws and their application in solving electric circuits.
II	Discuss the construction, principle and operation of measuring instruments.
III	Analyze the characteristics of alternating quantities, DC machines and AC machines.
IV	Illustrate the V-I characteristics of various diodes and bi-polar junction transistor.

## COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

CAEE018.01	Analyze the circuits using Kirchhoff's current law and Kirchhoff's voltage law.
CAEE018.02	Use star delta transformation for simplifying complex circuits.
CAEE018.03	Generalize operation and principle of measuring instruments.
CAEE018.04	Demonstrate the working principle of DC motor, DC generator and transformer.
CAEE018.05	Describe the construction of DC motor, DC generator and transformer.
CAEE018.06	Classify the types of DC Generator and DC Motor.
CAEE018.07	Derive the emf equation of DC generator, transformer and Torque equation of DC motor.
CAEE018.08	Discuss the principle of operation of induction motor.
CAEE018.09	Explain the construction and characteristics of alternator.
CAEE018.10	Illustrate the generation of power in DC machines and AC machines.
CAEE018.11	Compare the operation of half wave, full wave and bridge rectifiers.
CAEE018.12	Differentiate the operation and biasing of semiconductor devices like diodes and transistor.
CAEE018.13	Apply the concept of diodes in converting AC to DC.
CAEE018.14	Distinguish the different configurations of transistor.
CAEE018.15	Examine the voltage, current and frequency of electric network using CRO.
CAEE018.16	Apply the knowledge of electromagnetic laws and basic concepts of electronics.
CAEE018.17	Process the knowledge and skills for employability and to succeed national and international level competitive examinations.

**MAPPING OF MODEL QUESTION PAPER QUESTIONS TO THE ACHIEVEMENT OF COURSE LEARNING OUTCOMES:**

<b>SEE QUESTION No.</b>	<b>COURSE LEARNING OUTCOMES</b>		<b>BLOOM TAXONOMY LEVEL</b>
1	a	CAEE018.01 Analyze the circuits using Kirchhoff's current law and Kirchhoff's voltage law.	Remember
	b	CAEE018.02 Use star delta transformation for simplifying complex circuits.	Understand
2	a	CAEE018.01 Analyze the circuits using Kirchhoff's current law and Kirchhoff's voltage law.	Remember
	b	CAEE018.03 Generalize operation and principle of measuring instruments.	Understand
3	a	CAEE018.04 Demonstrate the working principle of DC motor, DC generator and transformer.	Understand
	b	CAEE018.07 Derive the emf equation of DC generator, transformer and Torque equation of DC motor.	Understand
4	a	CAEE018.05 Describe the construction of DC motor, DC generator and transformer.	Understand
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6	a	CAEE018.08 Discuss the principle of operation of induction motor.	Understand
	b	CAEE018.08 Discuss the principle of operation of induction motor.	Understand
7	a	CAEE018.12 Differentiate the operation and biasing of semiconductor devices like diodes and transistor.	Understand
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	b	CAEE018.13 Apply the concept of diodes in converting AC to DC.	Understand
9	a	CAEE018.14 Distinguish the different configurations of transistor.	Understand
	b	CAEE018.14 Distinguish the different configurations of transistor.	Remember
10	a	CAEE018.14 Distinguish the different configurations of transistor.	Understand
	b	CAEE018.14 Distinguish the different configurations of transistor.	Understand

**Signature of Course Coordinator**