



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:ETC	Pattern:2022
Name of Course:Electrical Circuits and Machines	Course Code:ETC222004
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains __02__ page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1a) State and explain Norton's theorem. (6) CO1

Question No. 2

- 2a) Write the differential equation for a source-free series RLC circuit. (6) CO2

Question No. 3

- 3a) Define Z-parameters. Derive open-circuit equations for Z_{11} , Z_{12} , Z_{21} and Z_{22} . (8) CO3

OR

- 3b) Find h-parameters for the network shown in Fig. 1 (8) CO3

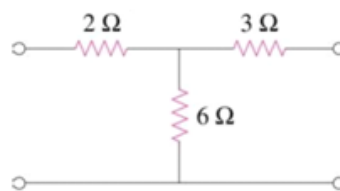
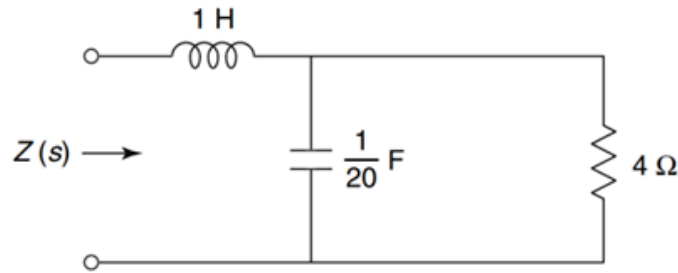


Fig. 1

- 3c) Explain the Reciprocity and Symmetry conditions for Z and Y parameters with examples. (8) CO3

OR

- 3d) Determine $Z(s)$ in the network shown in Fig. 3. Find poles and zeros of $Z(s)$ and plot them on s -plane. (8) CO3



Question No. 4

- 4a) Explain with a neat diagram the construction and working principle of a DC generator. (8) CO4

OR

- 4b) A 120 V DC shunt motor draws a current of 200 A. The armature resistance is 0.02 ohm, and the shunt field resistance of 30 ohm. Find the back EMF. If the lap-wound armature has 90 slots with 4 conductors per slot, at what speed will the motor run, when the flux per pole is 0.04 Wb? (8) CO4

- 4c) Explain the construction and working principle of a 3-phase induction motor. (8) CO4

OR

- 4d) What are types of 3- phase induction motor? The stator of a three phase Induction Motor has 3 slots/pole/phase. If supply frequency is 50 Hz. Calculate: (8) CO4

1. The number of stator poles produced and number of slots on the stator
2. Speed of rotating stator flux

Question No. 5

- 5a) What is a brushless DC motor? Give any 3 advantages of a BLDC motor. Differentiate between brushed DC motor and brushless DC motor. (8) CO5

OR

- 5b) Describe the different modes of operation of a stepper motor: (8) CO5

- Single stepping
- Half stepping
- Full stepping
- Microstepping

Explain each mode with neat diagrams and indicate how step angle changes.

- 5c) Explain the equivalent circuit and applications of PMDC motor. (8) CO5, CO6

OR

- 5d) Explain the construction and working principle of a BLDC motor. (8) CO5

..... End of question paper.....