

2021  
B.E. (Electronics and Communication Engineering)  
Third Semester  
EE-309: Electrical Science

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

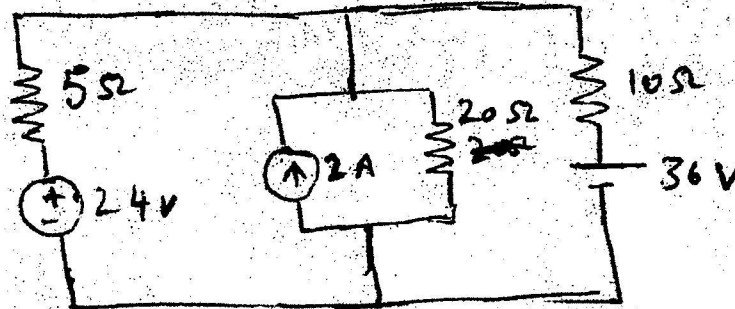
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I. Attempt the following:-

- Define voltage, current and resistance.
- Calculate the coefficients of mutual inductance if  $M = 10H$ ,  $L_1 = 5H$  &  $L_2 = 5H$ .
- Discuss in short, the various applications of electrical motors.
- Explain why a starter is required in a 3-phase induction motor.
- Sketch poles & zeros of network function  $N(s) = 10(s+2)/s(s+4)$ . (5x2)

UNIT - I

- II. a) For the circuit shown in Fig., use nodal analysis to find the current delivered by 24 V source.



- b) State and prove maximum power transfer theorem. (2x5)
- III. a) Explain the concept of complex frequency. Also write about the physical significance of complex frequency.
- b) Describe in detail about the stability of networks functions. What is the need for finding stability of a network and how can we convert an unstable network in to a stable network? (2x5)

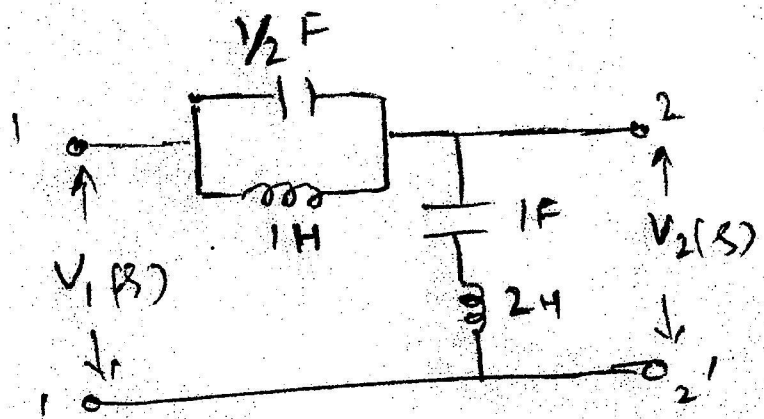
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- IV. a) Explain the transformation of star connection in to a delta connection.  
 b) State and prove Norton's Theorem. (2x5)

UNIT – II

- V. a) Explain the working principle of single phase induction motor.  
 b) For the network shown in Fig. given below, find the following functions:-  
 (i)  $Z_{11}(s)$  (ii)  $Y_{11}(s)$  (iii)  $G_{21}(s)$  and (iv)  $d_{21}(s)$ .



(2x5)

- VI. a) Explain in detail different classification of electrical filters and describe the differences between a constant k and m-derived filters.  
 b) Derive the mathematical relation between Z-parameters and Y-parameters. (2x5)
- VII. a) A four pole 50 Hz, three phase induction motor has rotor resistance of 0.5 ohms. The maximum torque occurs at a speed of 1500 rpm. Calculate the ratio of starting torque to maximum torque.  
 b) Describe the characteristics of a composite filter. Explain how a composite filter is different from constant-K and m-derived filters. (2x5)