

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2018

B. Tech/ M. Tech (as applicable) in Electrical.....Engineering, Semester IV.....

Roll No.....

COURSE CODE: EE402

Time: 3 hours

Max. Marks: 100

COURSE TITLE: Network Theory -II

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

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- i. Two coils are wound on a common magnetic core. The sign of mutual inductance M for finding out effective inductance of each coil is positive if the.
 - (a) Two coils are wound in the same sense.
 - (b) Fluxes produced by the two coils are equal.
 - (c) Fluxes produced by the two coils acts in the same direction.
 - (d) Fluxes produced by the two coils act in opposite.
- ii. Two two-port networks are connected in cascade. The combination is to be represented as a single two-port network. The parameters are obtained by multiplying the individual.
 - (a) z-parameter matrix
 - (b) h-parameter matrix
 - (c) y-parameter matrix
 - (d) ABCD parameter matrix
- iii. For very high frequencies, the driving-point admittance function, $Y(s) = \frac{4(s+1)(s+3)}{s(s+2)(s+4)}$ behaves as
 - (a) A resistance of $\frac{3}{2} \Omega$
 - (b) A capacitance of 4 F
 - (c) An inductance of $\frac{1}{4} H$
 - (d) An inductance of 4 H
- iv. With the usual notations, a two-port resistive network satisfies the conditions $A=D=\frac{3}{2}, B=\frac{4}{3}C$. the Z_{11} of the network is
 - (a) $\frac{5}{3}$
 - (b) $\frac{4}{3}$
 - (c) $\frac{2}{3}$
 - (d) $\frac{1}{3}$
- v. The coupling between two magnetically coupled coils is said to be ideal if the coefficient of coupling is
 - (a) Zero
 - (b) 0.5
 - (c) 1
 - (d) 2
- vi. A two-port network has transmission parameters $\begin{bmatrix} A & B \\ C & D \end{bmatrix}$. The input impedance of the network at port 1 will be.

- (a) $\frac{A}{C}$ (b) $\frac{AD}{BC}$ (c) $\frac{AB}{DC}$ (d) $\frac{D}{C}$
- vii. For an RC driving-point impedance function, the poles and zeros
- Should alternate on the real axis
 - Should alternate only on the negative real axis
 - Should alternate on the imaginary axis
 - Can lie anywhere on the left half-plane
- viii. For a two-port symmetrical bilateral network, if $A = 3$ and $B = 1$, the value of parameter C will be
- 4
 - 6
 - 8
 - 16
- ix. The short-circuit admittance matrix of a two-port network is $\begin{bmatrix} 0 & -\frac{1}{2} \\ \frac{1}{2} & 0 \end{bmatrix}$. The two-port network is
- Non-reciprocal and passive
 - Non-reciprocal and active
 - Reciprocal and passive
 - Reciprocal and active
- x. Two coupled coils connected in series have an equivalent inductance of 16 mH or 8 mH depending on the inter connection. Then the mutual inductance M between the coils is
- 12 mH
 - $8\sqrt{2}$ mH
 - 4 mH
 - 2 mH

Q.2 Short answer type questions (4 questions @ 2.5 marks)

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- Derive the condition of reciprocity of open circuit impedance parameters (Z parameters).
- What do you mean by positive real functions? Write all the properties of positive real functions.
- What are the restrictions on pole zero locations for transfer functions.
- Compare cumulative coupling with differential coupling when inductances are connected in series circuit.

Q.3A State for each case, whether the polynomial is Hurwitz polynomial.

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(i) $P(s) = s^4 + s^3 + 5s^2 + 3s + 4$

(ii) $P(s) = s^3 + 4s^2 + 5s + 2$

Q.3B Test whether $F(s) = \frac{2s^3 + 2s^2 + 3s + 2}{s^2 + 1}$ is positive real function.

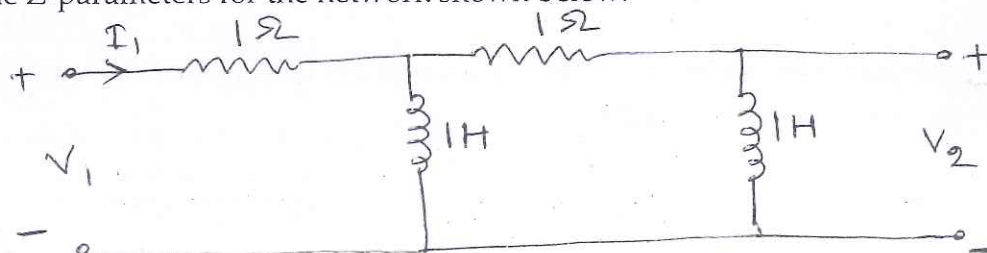
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Q.4A Realize the network having impedance function $Z(s) = \frac{6s^3 + 5s^2 + 6s + 4}{2s^3 + 2s}$

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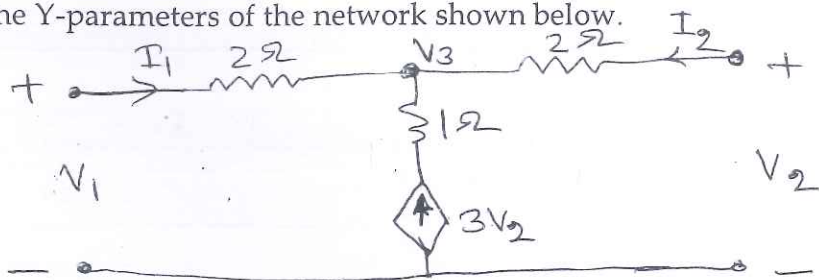
Q.4B Find the Z -parameters for the network shown below.

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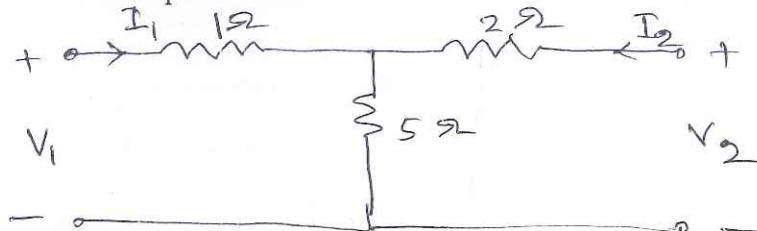
Q.5A Find the Y-parameters of the network shown below.

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Q.5B Find the transmission parameters for the network shown below.

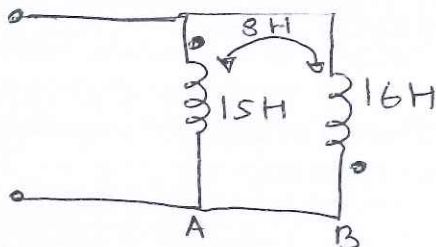
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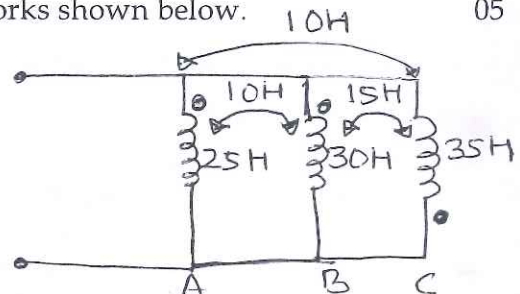
Q.6A Find the equivalent inductances for the two networks shown below.

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(a)

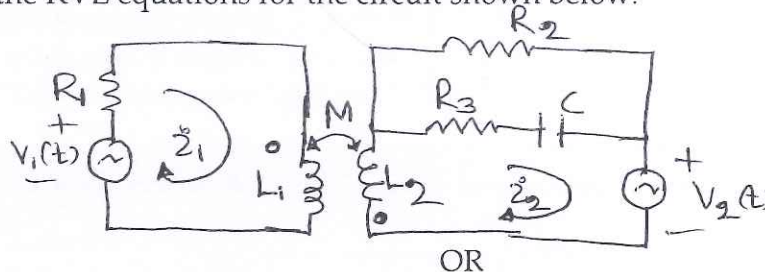


(b)



Q.6B Write the KVL equations for the circuit shown below.

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Q.6B What do you mean by filters? Explain the working of the following filters with proper diagrams.

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- Low-pass Filter
- High-Pass Filter
- Band-Pass Filter
- Band-stop Filter

Q.7A The z-parameters of a two-port network are $Z_{11} = 20 \Omega$, $Z_{22} = 30 \Omega$, $Z_{12} = Z_{21} = 10 \Omega$. Find Y and ABCD parameters.

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Q.7B The voltage $V(s)$ of a network is given by

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$$V(s) = \frac{3s}{(s+2)(s^2+2s+2)}$$

plot its pole zero diagram and hence obtain $v(t)$.

OR

Q.7B Currents I_1 and I_2 entering at port 1 and Port 2 respectively of a two-port network are given by the following equations.

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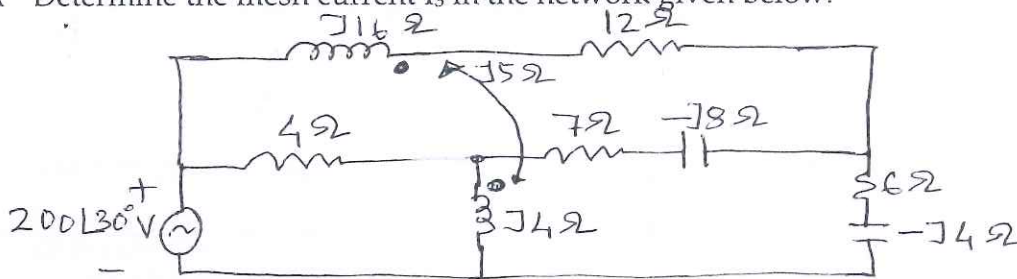
$$I_1 = 0.5 V_1 - 0.2 V_2$$

$$I_2 = -0.2 V_1 + V_2$$

Find Y, Z and ABCD parameters.

Q.8A Determine the mesh current I_3 in the network given below.

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Q.9A Realize the Foster (I, II) of the following LC impedance function.

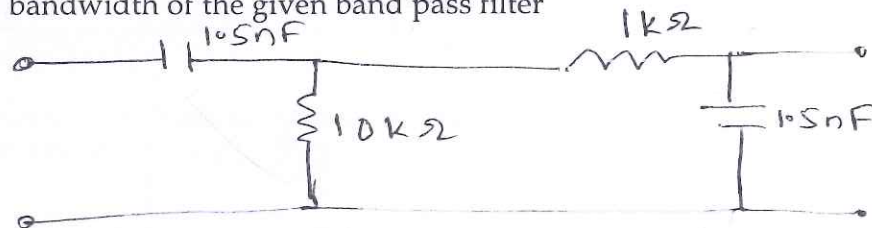
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$$Z(s) = \frac{4(s^2+1)(s^2+9)}{s(s^2+4)}$$

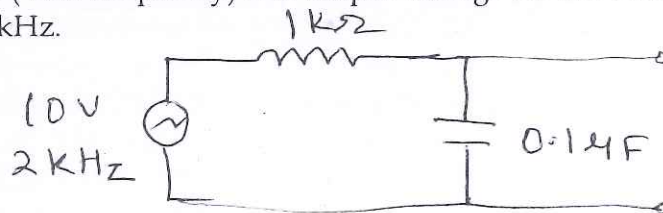
Q.9B

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- Design a high pass filter for 10 kHz cut-off frequency.
- Find the bandwidth of the given band pass filter



- Find (-3db frequency) and output voltage for the following low pass filter at 2 kHz.



OR

Q.9B Express Z-parameters in terms of

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- Y-parameters
- ABCD parameters
- A'B'C'D' parameters
- h-parameters
- g-parameters

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All the best!!