# Question Paper

Exam Date & Time: 02-May-2018 (09:30 AM - 12:30 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**INTERNATIONAL CENTRE FOR APPLIED SCIENCES**
**THIRD SEMESTER B.S (ENGG)**
**END-SEMESTER THEORY EXAMINATIONS APRIL - 2018**
**DATE : 2 MAY 2018**
**TIME : 9:30AM TO 12:30PM**
**SPECIAL NETWORK APPLICATIONS [EE 233]**

**Marks: 100** **Duration: 180 mins.**

## Answer 5 out of 8 questions.

1) Three impedances $Z_{AB} = (10 + j10)\ \Omega$, $Z_{BC} = (15 + j15)\ \Omega$, (10)

A) $Z_{CA} = (20 + j10)\ \Omega$ are connected in delta across a 400 V, 50 Hz, 3 phase, ABC supply. Determine the readings of the two wattmeters connected to measure the total power consumed if their current coils are in lines A and C and pressure coil is between AB and CB lines.

B) A 3 phase, 400 V, 50 Hz, RYB, 3 wire supply feeds an unbalanced Y-connected load. The branch impedances of the loads are: $Z_R = (4 + j8)\ \Omega$, $Z_Y = (3 + j4)\ \Omega$, $Z_B = (15 + j20)\ \Omega$. Find the line currents using Mesh current analysis. Assume RYB phase sequence. (10)

2) Three loads $Z_A = 80\Omega$, $Z_B = -j50\Omega$, $Z_C = j100\Omega$ are (12)

A) connected in star across a balanced, three phase 440V ABC supply. Calculate
i) Line currents
ii) Phase voltages
iii) Neutral shift voltage.

B) A symmetrical RYB, 400V, 50Hz, three phase supply is connected to unbalanced delta connected load. The load impedances are 150 $\Omega$ between R & Y, 50 $\mu$F between Y & B, (30+j70) $\Omega$ between B & R. (8)

1. Find Line currents
2. Draw the phasor diagram, assume RYB phase sequence.

3) A) A resistor and a capacitor are connected in series across a 150V ac supply. When the frequency is 40Hz, the circuit draws 5A. When the frequency is increased to 50Hz, it draws 6A. Find the values of resistance and capacitance. Also find the power drawn in the second case. (10)

B) Obtain the expression for resonant frequency for the given parallel circuit shown inFig. 3B. (10)

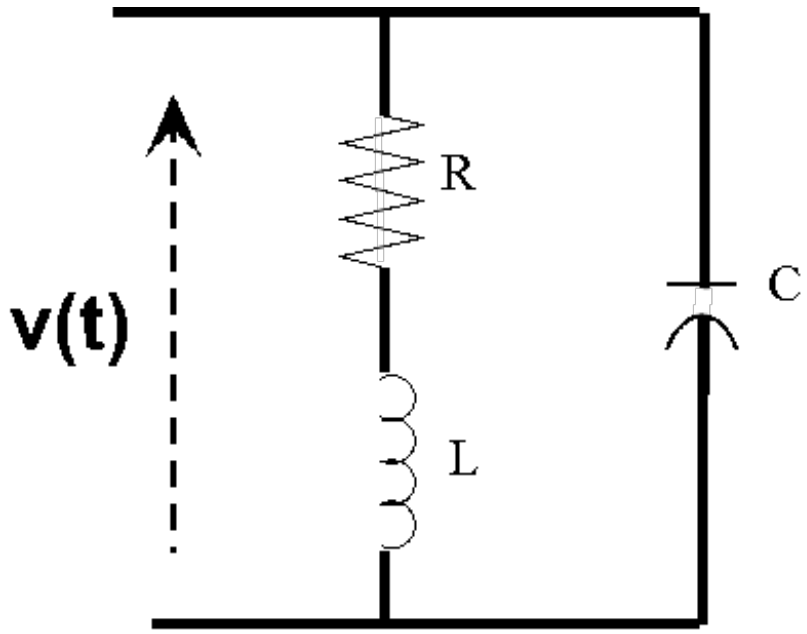



Fig. 3B

4) A) A coil of resistance R and inductance L is connected in series with a capacitor C across a variable frequency source. The voltage is maintained constant at 100V and the frequency is varied until a maximum current of 4A flows through the circuit at 10 KHz. Under these conditions, the Q factor of the circuit is 10. Calculate (8)
a) Voltage across the capacitor
b) The values of R,L and C.

B) Find active and reactive components of the current taken by a series circuit consisting of a coil of inductance 0.1 H and resistor 8$\Omega$ and a capacitor of 120$\mu$F connected to a 240V, 50Hz supply mains. Find the value of the capacitor that has to be connected in parallel with the above series circuit so that the p.f of the entire circuit is unity. (12)

5) A) Obtain the dotted equivalent for the circuit shown in Fig.5A and use the equivalent to find the equivalent inductive reactance. (5)

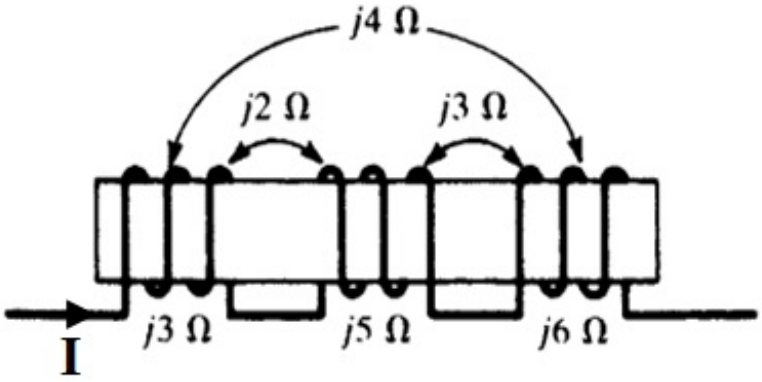



Fig.5A

B) A mild-steel ring having a cross-sectional area of 500 $mm^2$ and a mean circumference of 400 mm has a coil of 200 turns wound uniformly around it. Calculate: (5)
(a) The reluctance of the ring
(b) The current required to produce a flux density of 1.6 T in the ring
Take $\mu_r$ of mild-steel as 380 for flux density of 1.6 T

C) Obtain Thevenin and Norton equivalent circuits at terminals ab for the coupled circuit shown inFig. 5C. (10)

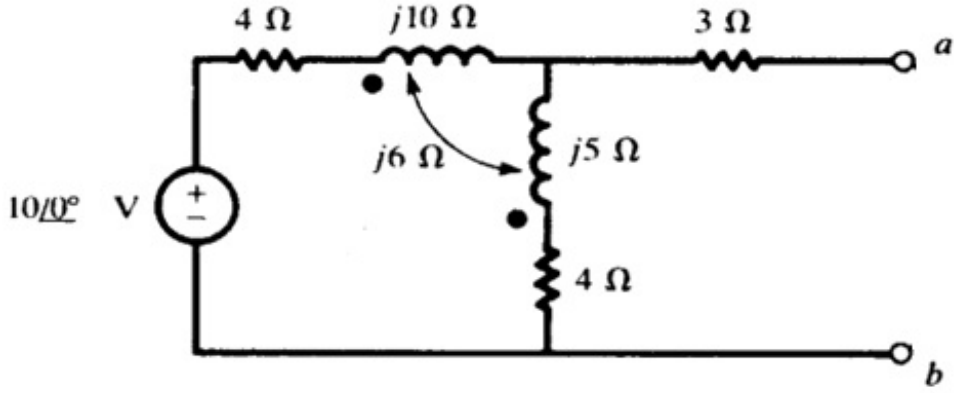



Fig. 5C.

6) Derive expressions for total inductances of two series connected coupled coils when their mutual fluxes are: (14)

A)
i) Aiding.
ii) Opposing.

B) Find the maximum and minimum inductance possible by connecting three magnetically coupled coils wound on the same core in series. Given the self-inductances of the coils are $L_1$ = 20 mH; $L_2$ = 30 mH; $L_3$ = 40 mH. The coefficient of couplings are $k_{12} = k_{23} = k_{31} = 0.8$. (6)

7) Determine h-parameters for the network shown in Fig.7A (6)

A)

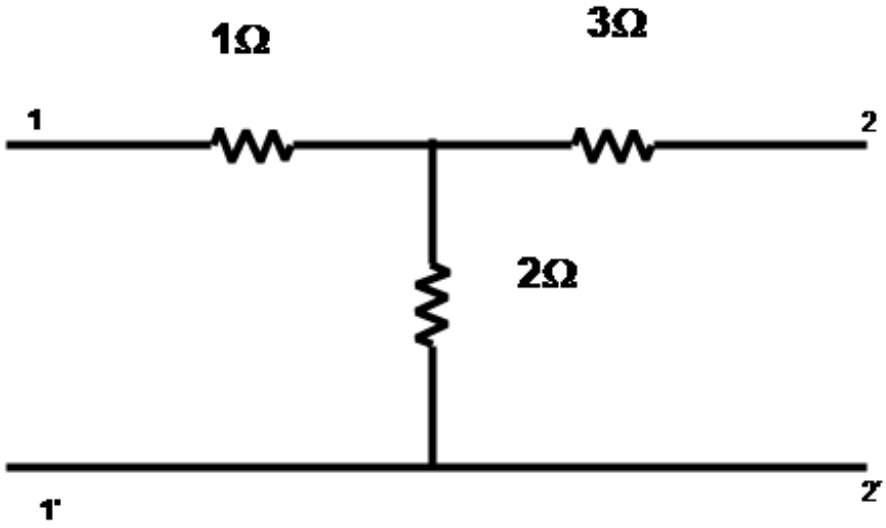



Fig.7A

B) The test results of two port network are given below, with port-2 open $I_1 = 0.1\angle 0$ A, $V_1 = 5.2\angle 50$ V, $V_2 = 4.1\angle -2.5$ V and with port-1 open $I_2 = 0.1\angle 0$ A, $V_1 = 3.1\angle -80$ V, $V_2 = 4.2\angle 60$ V Find [Z]. (6)

C) Find total input admittance of the network shown. (8)

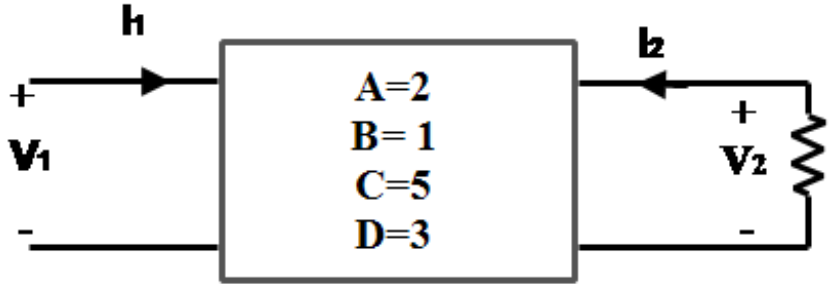
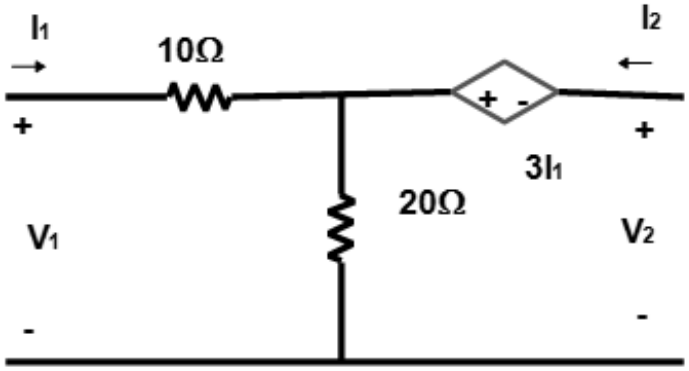



Fig.7C

8) Define T parameters. Derive T parameters in terms of h parameters. (10)

A)

B) Find the A,B,C,D parameters for the network shown in Fig.8B. and check whether thenetwork is symmetric and reciprocal. (10)



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