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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

B. Tech. Mid Semester Examination 2018-19

Electrical Technology Core (EEC-01)

Time: 2 hours **F.M.: 30**

(Answer all questions)

Answers of various parts of a question must be written at one place

1. (a) What is the difference between ideal and practical current source. 2

(b) Determine the equivalent resistance across X-Y of the circuit as shown in Fig. 1 by using star-delta transformation. 4

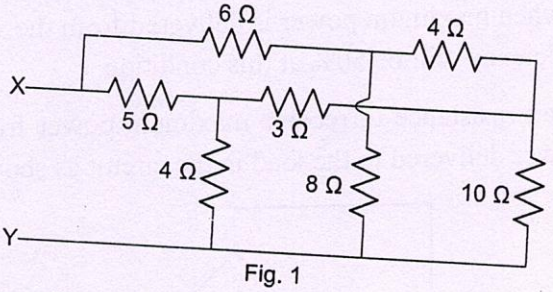

Fig. 1

(c) Determine the output voltage, V_{out} in the circuit as shown in Fig. 2 by using nodal method. 4

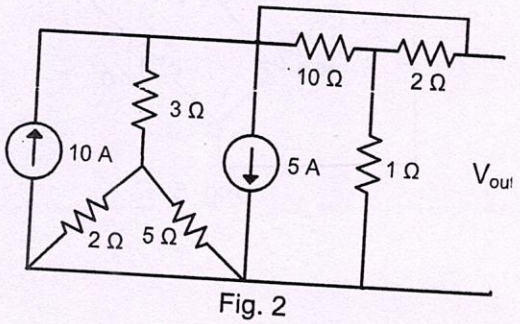

Fig. 2

2. (a) Superposition theorem is not applicable to non-linear circuit – Justify. 2

(b) Determine the current through 2Ω resistor of the circuit as shown in Fig. 3 by using superposition theorem. 5

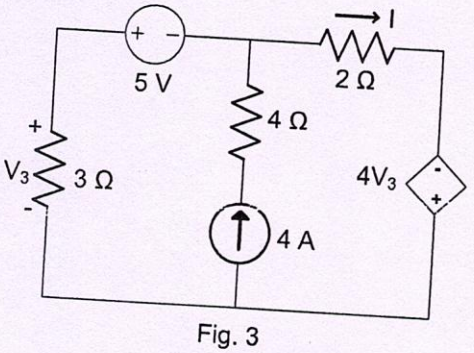

Fig. 3

(c) Verify the reciprocity theorem for the circuit as shown in Fig. 4. 3

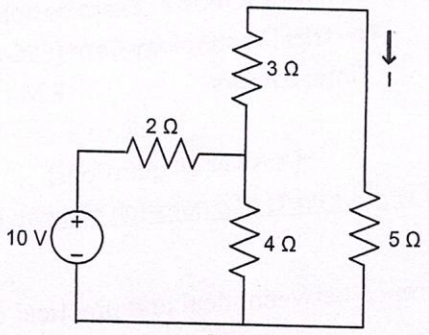

Fig. 4

3. (a) Prove that the internal impedence of the source will be the complex conjugate of load impedence when maximum power is delivered from the source to the load. Also prove that the efficiency will be 50% at this condition. 5

(b) Derive the load resistance to receive maximum power from the source; also find the maximum power delivered to the load in the circuit as shown in Fig. 5. 5

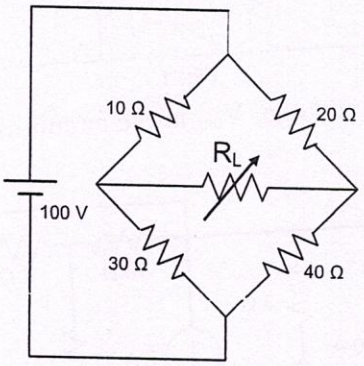

Fig. 5

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NATIONAL INSTITUTE OF TECHNOLOGY, DURGAPUR
DEPARTMENR OF ELECTRICAL ENGINEERING
Mid-term Assessment (18)

Subject: Network Analysis and Synthesis (EEC-301)

Time: 2 hours

F.M. = 30

Answer any three questions.

1. [3.5+3.5+3]

(a) Find the mesh currents for the circuit shown in figure 1.a using mesh analysis.

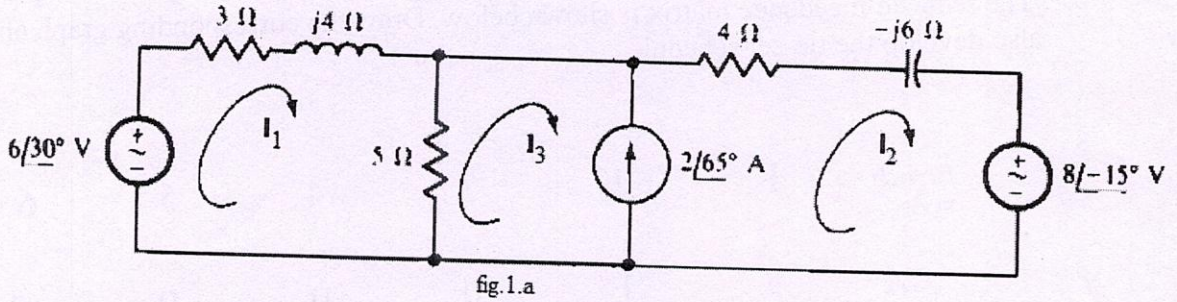

fig.1.a

(b) Find the node voltage of the circuit shown in figure 1.b.

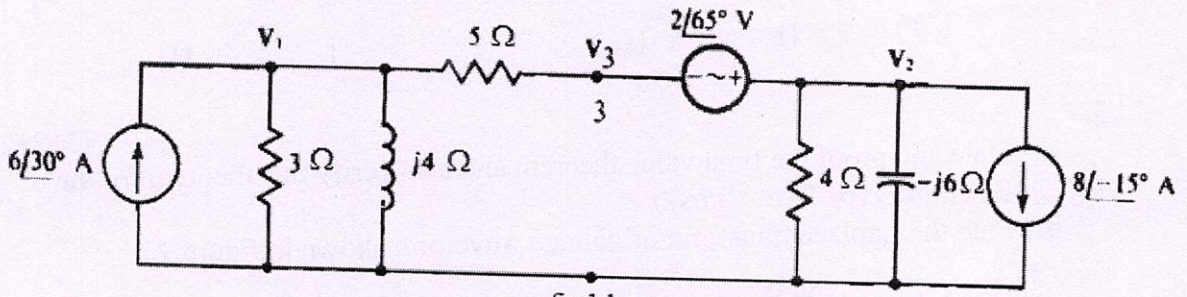

fig.1.b

(c) Obtain the Thevenin's equivalent of the network shown in figure 1.c at terminals a-b.

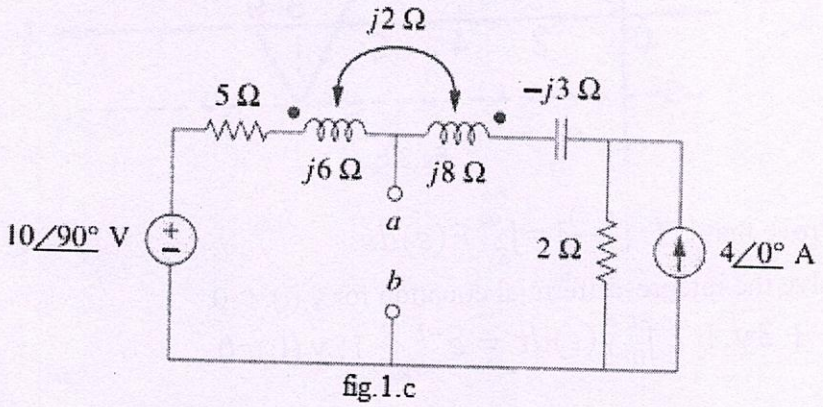

fig.1.c

2.

[5+5]

a. Determine the voltages V_2 and V_3 for the circuit shown in figure 2.a using cut-set analysis.

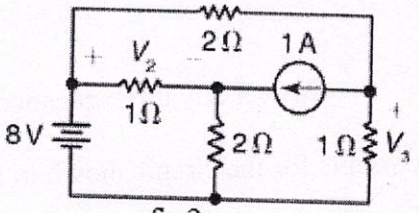

fig.2.a

b. The reduced incedence matrix is shown below. Draw the corresponding graph and also develop the tie-set schedule.

$$A_a = \begin{array}{c} \text{Branch} \rightarrow \\ \text{node} \downarrow \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ -1 & 0 & 1 & 1 & 0 & 1 \\ 0 & -1 & -1 & 0 & 1 & 1 \\ 0 & 0 & 0 & -1 & 0 & 1 \end{bmatrix} \end{array}$$

3.

[3+2+2+3]

a. State and proof the final value theorem and also verify this theorem for the function f (t)= $2+e^{-3t}cos2t$.

b. Find the Laplace transform of voltage waveform shown in figure 3.b.

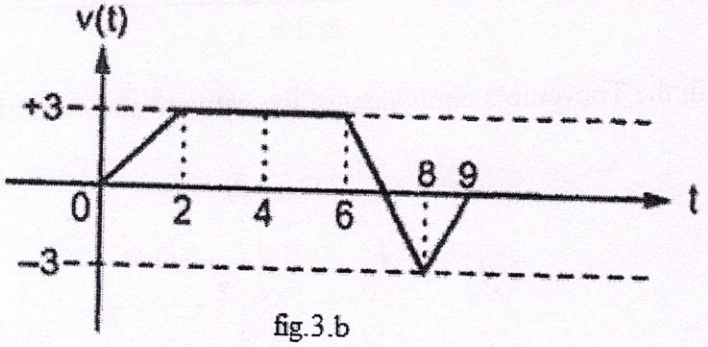

fig.3.b

c. Prove that L.T. $[\frac{f(t)}{t}] = \int_S^\infty F(s)ds$.

d. Solve the integro-differntial equation for y (t), t>0.

$\frac{dy}{dt} + 3y + 2\int_0^t y(t)dt = e^{-t} + 1$; y (0)=0.

4. [3.5+3.5+3]

a. Determine the value of the out voltage for the circuit shown in figure 4.a, if $V_{in}(t)= 10\cos(377t)$ and coupling coefficient=0.8.

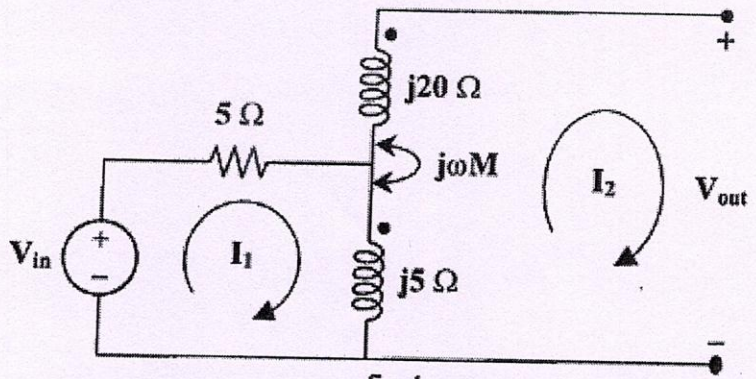

fig.4.a

b. In the circuit of figure 4.b, find the voltage V. Interchange the source and resulting voltage V and show that reciprocity theorem is verified.

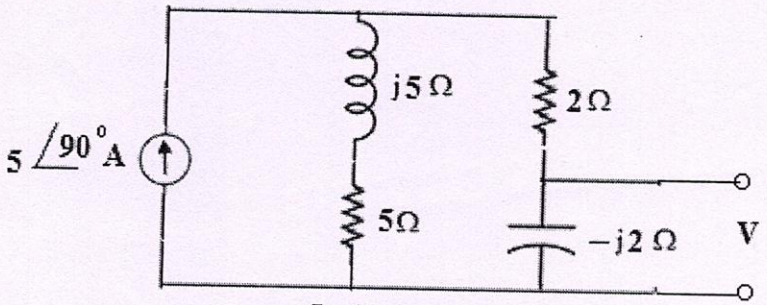

fig.4.b

c. State and prove the convolution theorem. Find the inverse Laplace transform for the function $F(s) = \frac{s}{(s^2+a^2)^2}$ using this theorem.

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Midsemester Examination

Sub: Electrical &Electronic Measurement Code: EEC 302

Full Marks: 30 Time 2 Hours

All parts of a question must be written at same place. Provide circuit diagram and phasor diagram whenever necessary.

Answer any five questions. 5X6=30

1. (a) What is difference between accuracy and precision?
   (b) Why does current coil of wattmeter consist of few numbers of turns?
   (c) Why is sensitivity of electrodynamometer type instrument less compared to PMMC instrument?
   (d) The inductance of moving iron instrument is given by $L= 8+4\theta-(1/2)\theta^2$ μH where θ is the deflection in radian from zero position. If the control spring constant is $12X10^{-6}$ Nm/rad, find the scale position in degree for I=1A. (1+1+1+3)

2. (a) Develop the deflecting torque equation of electrodynamometer type instrument.
   (b) Two wattmeters connected to measure the input to a balanced 3 phase circuit indicate 2000 watts and 500 watts respectively. Find the power factor of the circuit when (i) both readings are positive and (ii) the later reading is obtained (500 watts) is obtained after reversing the connection of current coil. (3+3)

3. (a) Why is scale of moving iron instrument initially cramped?
   (b) Why PMMC instrument cannot measure alternating currents?
   (c) A moving coil instrument having meter resistance of 5Ω is capable providing 400mA full scale deflection. To extend the current range upto 10A a shunt made up by manganin is inserted. What will be error in full scale meter reading if the temperature is increased from 0 degree to 25 degree. If a swamping resistance of 50Ω made up by manganin is inserted into circuit with modified shunt resistance, what will be error in full scale reading for same temperature increment? (2+1+3)

4. (a) Explain principle of operation of single phase energy meter.
   (b) An energy has to be tested for 5A rated d.c. load current. The shunt coil circuit of energy meter is having resistance of 8800Ω. If the energy meter is tested by connecting across rated 220V d.c. supply what will be power loss in shunt coil circuit and series coil circuit? If the phantom loading arrangement is used with 50V d.c. supply feeding the series coil circuit, what will be power loss in both series coil and shunt coil circuit? (3+3)

5. (a) Explain how can earth resistance be measured by three electrode method?
   (b) A 440V, 3 phase 4 wire system supplies power to star connected load. The loads are given by $Z_{AN}= 20+j10\ \Omega$, $Z_{BN}= 20-j25\ \Omega$, $Z_{CN}= 30\Omega$. Calculate the readings of watt meters considering phase sequence A-B-C.

(i) Wattmeter W_1: PC is across phases A and C, CC is series with A
(ii) Wattmeter W_2: PC is across neutral line N and phase C, CC is series with Neutral Line N
(iii) Wattmeter W_3: PC is across phases B and C, CC is series with phase B .

(2+4)

6. (a) Deduce the relationship between bridge sensitivity and voltage sensitivity of Wheatstone bridge having four equal arm resistances and change in unknown resistance occurs due to change in temperature.
(b) What will be percentage of steady state deflection will be observed for critically damped instrument if the input is applied at the instant which is twice time period of the moving system? Deduce the formula you have used.

(3+3)

7. (a) How can insulation resistance be measured by loss of charge method?
(b)Two groups of students were asked to test two similar voltmeters. Their observations for measurement of true value of 100V are given below:

Group-1	Group-2
100.1V	104.3V
101.2V	104.2V
102.3V	103.9V
99.8V	100.9V
98.8V	104.8V
97.6V	104.6V

Which group will yield more precise and more accurate result?

(3+3)

20/100