Total No. of Questions—12] [Total No. of Printed Pages—7

DEC-2008

[3462]-150

S.E. (Electronics) (Second Semester) EXAMINATION, 2008

ELECTRONIC CIRCUIT AND APPLICATIONS

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (*a*) Determine V_o and draw output waveform for the circuit in Fig. 1. [4]

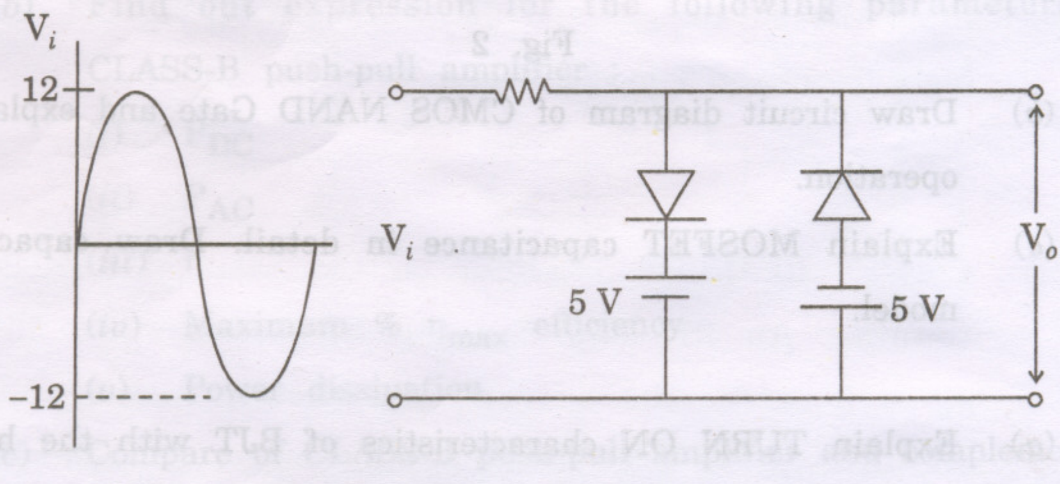

Fig. 1

P.T.O.

(*b*) Explain full wave doubler circuit in detail. [4]

(*c*) Draw circuit diagram of CMOS-NOR Gate and explain its operation. [8]

Or

2. (*a*) The diodes in the circuit shown in Fig. 2 are ideal. Sketch the transfer characteristics for $-20\ V \le V_1 \le 20\ V$. If the diode D_2 is reversed biased, sketch the resulting characteristics for $-20\ V \le V_1 \le 20\ V$. [6]

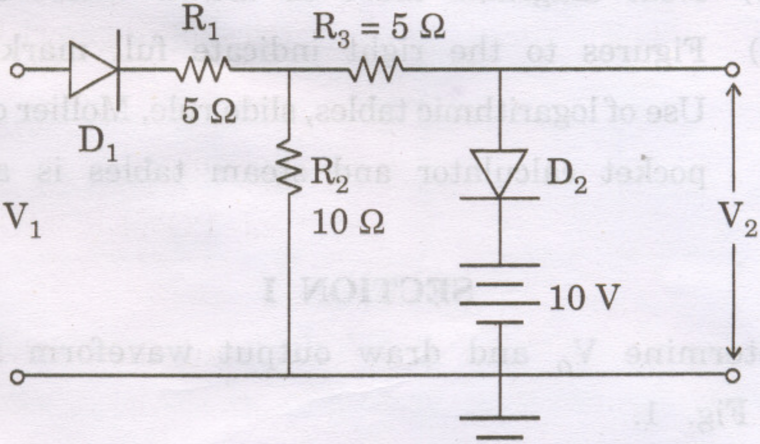

Fig. 2

(*b*) Draw circuit diagram of CMOS NAND Gate and explain its operation. [8]

(*c*) Explain MOSFET capacitance in detail. Draw capacitance model. [2]

3. (*a*) Explain TURN ON characteristics of BJT with the help of different parameters and draw waveform. [6]

(b) The power dissipation of a transistor is specified as $P_{D(max)} = 150$ W at $T_{CO} = 25°C$. The transistor is mounted on a heat sink. The thermal resistance are :

$\theta_{jC} = 0.6°C/W$, $\theta_{CS} = 0.3°C/W$, $\theta_{SA} = 1.8°C/W$

if $T_{j(max)} = 200°C$ and ambient temperature is 40°C. Calculate the maximum permissible power dissipation of the transistor. [6]

(c) Explain feature of POWER MOSFET. [4]

Or

4. (a) Explain TURN-OFF characteristics of BJT with waveform in detail. [6]

(b) Explain *di*/*dt* and *dv*/*dt* protection. [6]

(c) Explain any *one* drive circuit of POWER MOSFET. [4]

5. (a) Explain CLASS-C amplifier in detail their advantages, disadvantages and applications. [6]

(b) Find out expression for the following parameters for CLASS-B push-pull amplifier :

(i) P_{DC}

(ii) P_{AC}

(iii) η

(iv) Maximum % η_{max} efficiency

(v) Power dissipation. [8]

(c) Compare of CLASS-B push-pull amplifier and complementary symmetry circuits (minimum 6 points). [4]

Or

6. (a) Explain different types of distortions in detail. [6]

(b) A complementory push-pull amplifier has capacitive coupled load $R_L = 8\ \Omega$, supply voltage ± 12 V, calculate :

(i) $P_{ac(max)}$

(ii) P_{dc} of each transistor

(iii) Efficiency. [8]

(c) Explain CLASS-A push-pull amplifier. Draw its diagram. [4]

SECTION II

7. (a) A BJT has the following parameters $h_{ie} = 1\ k\Omega$, $h_{fe} = 100$, h_{re} and h_{oe} are negligible $C_c = 3$ pf, the collector current is 10 mA at room temperature. The short circuit current gain is 10 at frequency 10 MHz. Calculate value of f_α, f_β, f_T. [6]

(b) Find out expression for current gain with resistive load for CE amplifier. [6]

(c) State the advantages and disadvantages of T-model. Explain high frequency T-model. [6]

Or

8. (a) Classify RF tuned amplifier on the basis of methods, of tunning. An RF amplifier use FET with $r_d = 500\ k\Omega$ $g_m = 5$ mA/V. The drain tunned circuits consist of a coil 200 μH with Q = 50. Calculate the values of capacitor and gain if centre frequency is 1.59 MHz. [6]

(*b*) A single stage CE amplifier has upper 3 db frequency of voltage gain, $F_H = 4$ MHz with load resistance $R_L = 600\ \Omega$, if the transistor parameters are $g_m = 50$ mA/V, $h_{fe} = 100$, $r'_{bb} = 100\ \Omega$, $C_c = 3$ pf and $F_T = 300$ MHz.

Calculate :

(*i*) The value of source resistance which will result in req. F_H.

(*ii*) The mid band gain with above values of R_S. [8]

(*c*) Explain the characteristics of tunned circuits with proper formulas and waveform. [4]

9. (*a*) Derive the expression for the voltage gain with positive feedback A_F. Comment on result. [4]

(*b*) The circuit shows three stage FET amplifier the identical FET have the following parameters $r_d = 8$ kΩ, $g_m = 5$ mA/V, $R_g = 1$ mΩ, $R_g = R_1 + R_2$, $R_1 = 50\ \Omega$, $R_d = 40$ kΩ. Calculate voltage gain including feedback. [8]

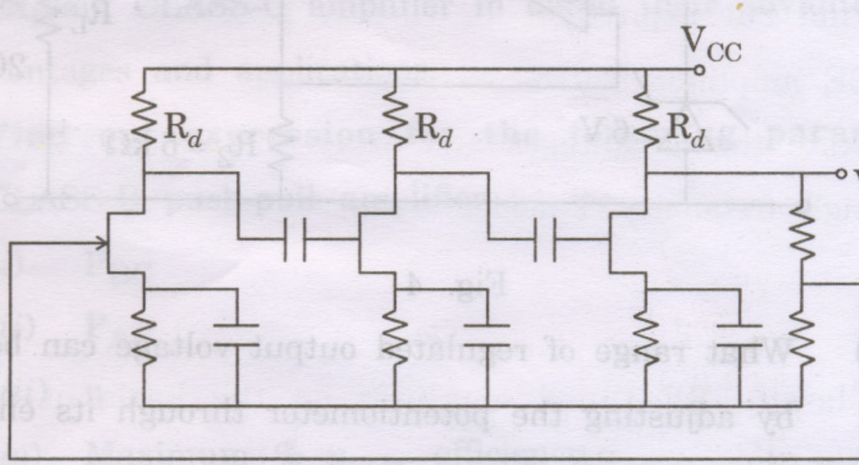

Fig. 3

(*c*) State Barkhausen criterion and explain with the help of waveform. [4]

Or

10. (*a*) Explain Colpitts oscillator and calculate frequency of oscillations of Colpitts oscillator with $C_1 = C_2 = 600$ pf and L = 2 MHz. [6]

(*b*) Derive the expression of the input resistance with feedback and comment on result for the current series feedback. [6]

(*c*) State the advantages and disadvantages of Negative feedback. [4]

11. (*a*) A 9 V stabilized voltage supply is required to run a car-stereo system from car's 12 V battery. A Zener diode with $V_2 = 9$ V and $P_{max} = 0.5$ watt is used as a voltage. Find the values of the series resistor R. [4]

(*b*)

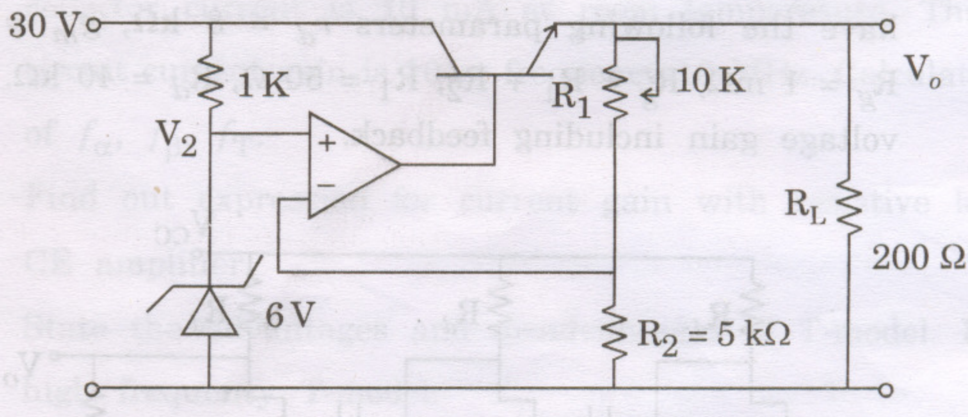

Fig. 4

(*i*) What range of regulated output voltage can be obtained by adjusting the potentiometer through its entire range (R_1 = 10 K) ?

(*ii*) How much power is dissipated in the pass transistor when the potentiometer is set for maximum resistance ? [6]

(*c*) Design dual power supply using voltage regulator I_C for +12 and –12 V. Explain frequency of each component used and why. [6]

Or

12. (*a*) Explain block diagram of voltage shunt regulator in detail. [6]

(*b*) Calculate the minimum and maximum output voltage for the voltage regulator of Fig. 5. [4]

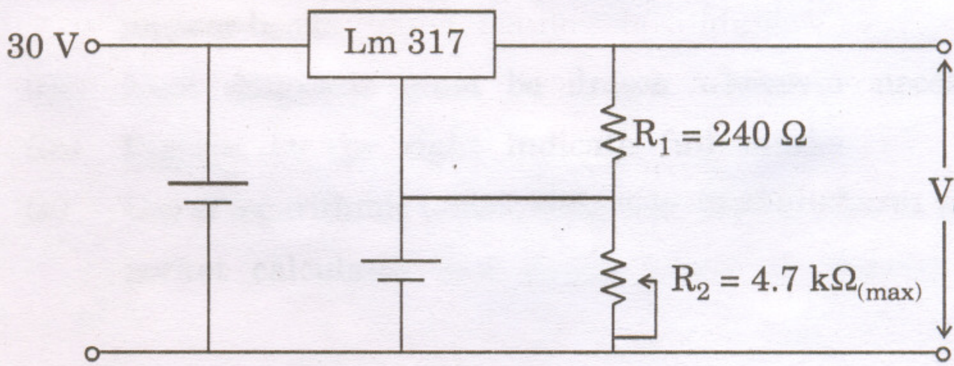

Fig. 5

(*c*) What are different protection in the regulator ? Explain over voltage protection. [6]

Total No. of Questions—12] [Total No. of Printed Pages—8

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S.E. (E & TC/Comp./I.T./Elect./Instru.) EXAMINATION, 2008

ENGINEERING MATHEMATICS—III

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve the following (any *three*) : [12]

(*i*) $\frac{d^2y}{dx^2} - \frac{6dy}{dx} + 9y = e^{3x} \operatorname{cosec}^2 x + 5^x$

(*ii*) $\left(D^4 + D^2 + 1\right) y = 36x^2 - 17$

(*iii*) $\left(D^2 + 6D + 8\right) y = e^{e^{2x}}$

(*iv*) $\frac{d^2y}{dx^2} + 9y = 9 \sec 3x \tan 3x$ (by variation of parameters)

(*v*) $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{dy}{dx} + xy = \sin(\log x)$.

(*b*) An electric current consists of an inductance 0.1 henry, a resistance R of 20 ohms and a condenser of capacitance C of 25 micro-farads. Find the charge q and current i at any time t, given at $t = 0, q = 0.05$ coulombs, $i = \frac{dq}{dt} = 0$. [5]

Or

2. (*a*) Solve the following (any *three*) : [12]

(*i*) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = \frac{1}{1+e^x}$

(*ii*) $\left(D^2 - 4D + 4\right) y = xe^{2x} \sin x$

(*iii*) $\left(D^3 + D\right) y = \sin x + 5e^x$

(*iv*) $\left(D^2 + 9\right) y = \frac{1}{1 + \sin 3x}$ (by variation of parameters)

(*v*) $(x+3)^2 \frac{d^2y}{dx^2} - 4(x+3)\frac{dy}{dx} + 6y = x.$

(*b*) Solve simultaneously :

$$\frac{dx}{dt} - 3x - 6y = t^2$$

$$\frac{dy}{dt} + \frac{dx}{dt} - 3y = e^t.$$ [5]

3. (*a*) Find the analytic function whose real part is

$$\frac{\sin 2x}{\cosh 2y - \cos 2x}.$$ [6]

(*b*) Evaluate :

$$\oint \frac{\sin 2z}{\left(z + \frac{\pi}{3}\right)^4} dz$$

where 'C' is $|z| = 2$. [5]

(c) Find the invariant points of the transformation

$$w = \frac{2z - 6}{z - 2}.$$ [5]

Or

4\. (a) Show that the transformation

$$w = \frac{z - b}{z + b}$$

maps the right half of the z-plane into the unit circle $|w| < 1$. (b is a real positive number.) [5]

(b) Evaluate :

$$\int_C \frac{\sin \pi z^2 + \cos \pi z^2 \, dz}{(z-1)^2 (z-2)}$$

where C is the circle $|z| = 3$. [6]

(c) Show that analytic function with constant amplitude is constant. [5]

5\. (a) Establish the following relation :

$$e^{-2x} - e^{-3x} = \frac{10}{\pi} \int_0^\infty \frac{\lambda \sin \lambda x}{\left(9 + \lambda^2\right)\left(4 + \lambda^2\right)} d\lambda, x > 0.$$ [6]

(b) Solve the following integral equation :

$$\int_0^\infty f(x) \cos \lambda x \, dx = e^{-\lambda}, \lambda > 0.$$ [5]

(c) Find the z-transform of (any *two*) : [6]

(i) $f(k) = \left(\frac{2}{3}\right)^{|k|}$ for all k

(ii) $f(k) = \frac{(-3)^k}{k!}\ k \geq 0$

(iii) $f(k) = 2^k \cosh \alpha k\ \ k \geq 0.$

Or

6. (a) Find inverse of z-transformation of any *two* : [8]

(i) $\mathrm{F}(z) = \frac{z^2}{\left(z - \frac{1}{4}\right)\left(z - \frac{1}{5}\right)}\ \frac{1}{5} < |z| < \frac{1}{4}.$

(ii) $\mathrm{F}(z) = \frac{z^2}{z^2 + 4}\ |z| > 2.$

(iii) $\mathrm{F}(z) = \frac{z^3}{(z-3)(z-2)^2}\ |z| > 3.$

(b) Show that the Fourier transform of

$$f(x) = e^{-|x|} \text{ is } \frac{2}{1+\lambda^2}.$$ [5]

(c) Find $\mathrm{Z}(x_k)$ if

$$x_k = \frac{1}{2^k} * \frac{1}{3^k} * \frac{1}{(-5)^k}\ \ k \geq 0,$$

by convolution theorem. [4]

SECTION II

7. (*a*) Find the Laplace transforms of (any *two*) : [8]

(*i*) $\dfrac{e^{-3t}\sin 2t}{t}$

(*ii*) $f(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}$

(*iii*) $\text{erf}\left(\sqrt{t}\right)$.

(*b*) Evaluate :

$$\int_{-\infty}^{\infty} e^{-t}\, t^2\, \delta'(t-2)\, dt.$$ [4]

(*c*) Solve, using Laplace transform

$$y'' + y = 0, \quad y(0) = 1, \; y'(0) = 2.$$ [4]

Or

8. (*a*) Find inverse Laplace transforms of (any *two*) : [8]

(*i*) $\dfrac{s^3}{s^4 - a^4}$

(*ii*) $\log \dfrac{s^2+1}{s^2+s}$

(*iii*) $\dfrac{s\, e^{-\pi s}}{s^2 - 4s + 29}$.

(*b*) Express the following function in terms of unit step function and hence find the Laplace transform :

$$f(t) = \begin{cases} t+1, & 0 \le t \le 2 \\ 3, & t > 2. \end{cases}$$ [4]

(*c*) Verify the convolution theorem for $f(t) = e^{at}$, $g(t) = t$. [4]

9. (a) Prove the following (any *two*) : [8]

(i) $\nabla \times \left(\frac{\bar{a} \times \bar{r}}{r^3}\right) = -\frac{\bar{a}}{r^3} + \frac{3}{r^5}(\bar{a} \cdot \bar{r})\,\bar{r}$

(ii) $\nabla^4 (\log r) = \frac{2}{r^4}$

(iii) $\nabla \left[\bar{r} \cdot \nabla \left(\frac{1}{r^n}\right)\right] = \frac{n^2}{r^{n+2}}\,\bar{r}.$

(b) Find directional derivative of $\phi = 4y^2 z - 2xz^3$ at (1, 2, –1) along the line $x - 1 = 2(y + 1) = z - 2$. [5]

(c) If

$$\bar{r} \cdot \frac{d\bar{r}}{dt} = 0,$$

show that $\bar{r}$ has constant magnitude. [4]

Or

10. (a) If the directional derivative of

$$\phi = a(x + y) + b(y + z) + c(x + z)$$

has maximum value 12 in the direction parallel to

$$\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-1}{3},$$

find the values of a, b, c. [6]

(b) Show that :

$$\bar{F} = \frac{\bar{a} \times \bar{r}}{r^n}$$

is solenoidal field. [5]

(c) Show that :

$$\overline{\mathrm{F}} = \frac{1}{r}\left[r^2\, \overline{a} + (\overline{a} \,.\, \overline{r})\, \overline{r}\right]$$

is irrotational. Hence find ϕ such that $\overline{\mathrm{F}} = \nabla\phi$. [6]

11. (a) Find the work done in moving a particle from (0, 1, –1) to $\left(\frac{\pi}{2}, -1, 2\right)$ in a force field

$$\overline{\mathrm{F}} = \left(y^2 \cos x + z^3\right) \vec{i} + (2y \sin x - 4)\, \vec{j} + \left(3xz^2 + 2\right) \vec{k}. \quad [5]$$

(b) Evaluate :

$$\iint_{\mathrm{S}} \left(x\, \vec{i} + y\, \vec{j} + z^2\, \vec{k}\right) . d\overline{\mathrm{S}}$$

where S is the curved surface of the cylinder $x^2 + y^2 = 4$, bounded by the planes $z = 0$ and $z = 2$. [6]

(c) Evaluate :

$$\int_{\mathrm{C}} \left(xy\, dx + xy^2\, dy\right)$$

by Stokes's theorem, where C is the square in xy-plane with vertices (1, 0), (–1, 0), (0, 1), (0, –1). [6]

Or

12. (a) Evaluate :

$$\iint_{\mathrm{S}} \left(\nabla \times \overline{\mathrm{F}}\right) . \hat{n}\, d\mathrm{S}$$

where S is the curved surface of the paraboloid $x^2 + y^2 = 2z$, bounded by the plane $z = 2$, where

$$\overline{\mathrm{F}} = 3(x - y)\, \vec{i} + 2xz\, \vec{j} + xy\, \vec{k}. \quad [5]$$

(*b*) Evaluate :

$$\iint_S \overline{F} \cdot d\overline{S}$$

where

$$\overline{F} = \left(x + y^2\right) \vec{i} + y \vec{j} - 2zx \vec{k}$$

and S is the surface bounded by the planes $x = y = z = 0$ and $x + y + z = 1$. [6]

(*c*) Show that :

$$\overline{E} = -\nabla\phi - \frac{1}{c}\frac{\partial \overline{A}}{\partial t}, \overline{H} = \nabla \times \overline{A}$$

are solutions of Maxwell's equations :

(*i*) $\nabla \times \overline{H} = \frac{1}{c}\frac{\partial \overline{E}}{\partial t}$,

(*ii*) $\nabla \times \overline{E} = -\frac{1}{c}\frac{\partial \overline{H}}{\partial t}$

if

(1) $\nabla \cdot \overline{A} + \frac{1}{c}\frac{\partial \phi}{\partial t} = 0$,

(2) $\nabla^2 \overline{A} = \frac{1}{c^2}\frac{\partial^2 \overline{A}}{\partial t^2}$. [6]

Total No. of Questions—12] [Total No. of Printed Pages—8+4

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S.E. (Elex/ETC) (First Sem.) EXAMINATION, 2008

NETWORK THEORY

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) For the circuit shown in Fig. 1(*a*), find the branch currents I_1, I_2 and I_3 and node voltages V_1 and V_2. [6]

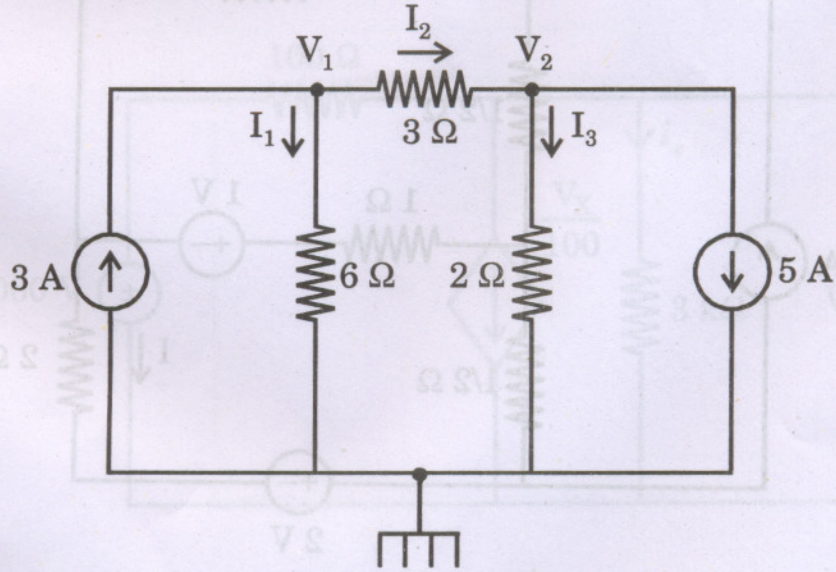

Fig. 1(*a*)

(*b*) For the network shown in Fig. 1(*b*), find $V_a(t)$ in the steady state if $V_1 = 2 \sin 2t$. [6]

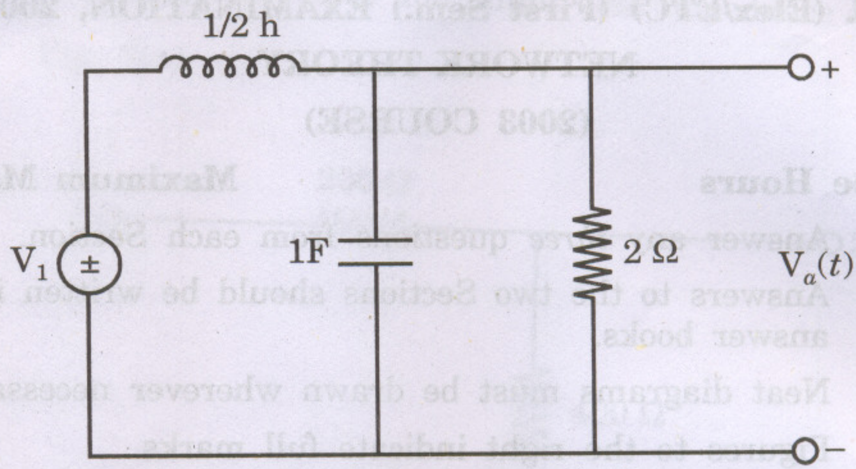

Fig. 1(*b*)

(*c*) Using source shifting and source transformation, find current 'I' in the circuit shown in Fig. 1(*c*). [6]

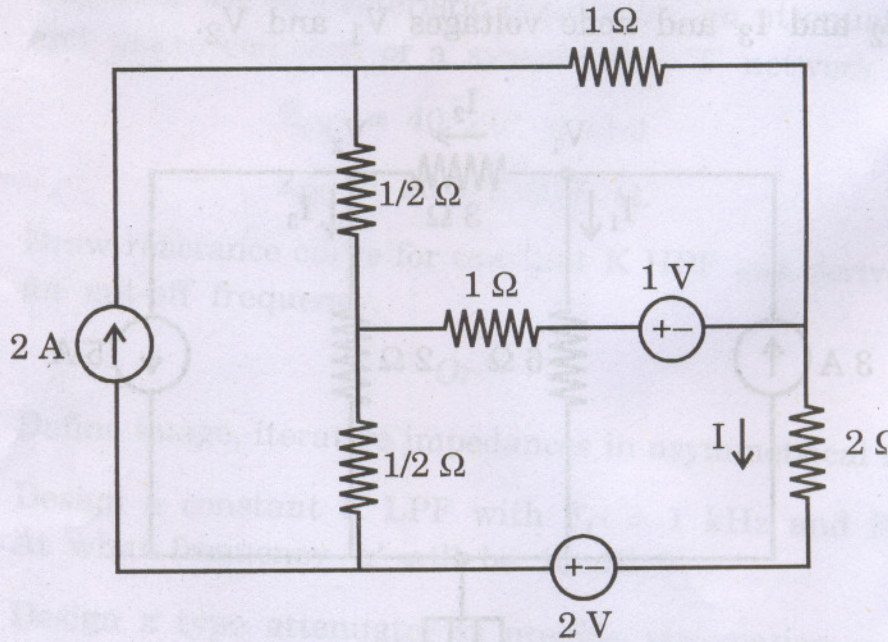

Fig. 1(*c*)

Or

2. (*a*) Determine the voltage V_1 in the circuit by using the superposition theorem. Refer Fig. 2(*a*). [6]

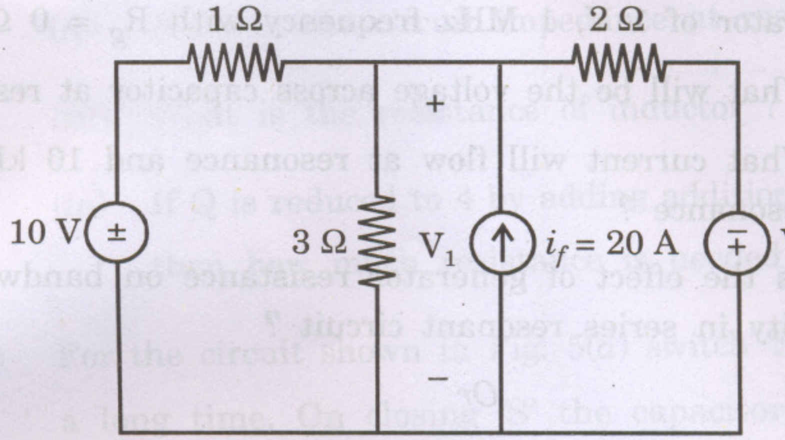

Fig. 2(*a*)

(*b*) State and prove maximum power transfer theorem. [6]

(*c*) Find Thevenin and Norton equivalent circuit across A-B in the circuit shown in Fig. 2(*c*). [6]

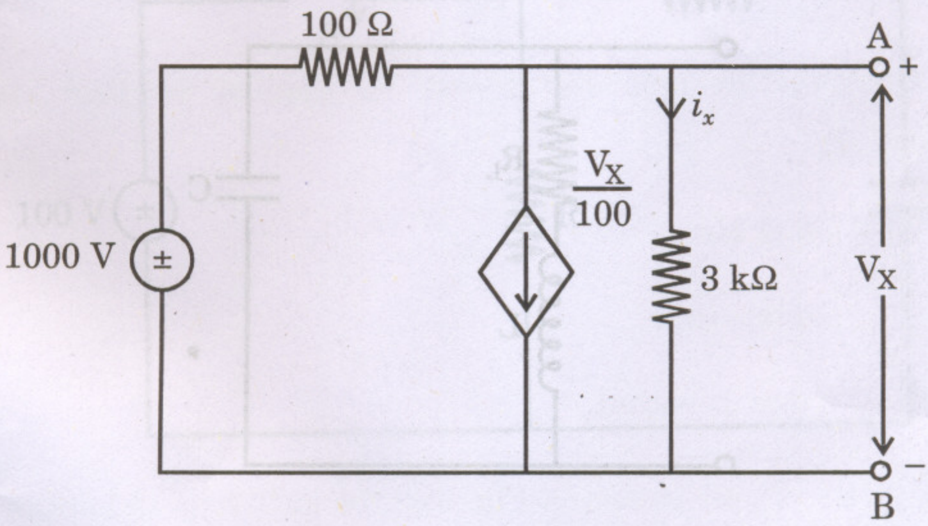

Fig. 2(*c*)

3. (*a*) Derive the expression for the impedance of a series resonating circuit in terms of Q_0 and δ. [6]

(*b*) A series circuit of negligible resistance and coil of 120 μH with 18 Ω resistance is resonated at 1 MHz. The circuit is driven by a generator of 1 V, 1 MHz frequency with $R_g = 0\ \Omega$.

(*i*) What will be the voltage across capacitor at resonance ?

(*ii*) What current will flow at resonance and 10 kHz above resonance ? [4]

(*c*) What is the effect of generator resistance on bandwidth and selectivity in series resonant circuit ? [6]

Or

4. (*a*) Give important property of series resonant circuit. Also give application of this circuit. [4]

(*b*) In the circuit shown in Fig. 4(*b*) the inductance of 0.1 H having Q factor of 5 is in parallel with capacitor. Determine the value of capacitance and coil resistance at resonant frequency of 500 rad/sec. [6]

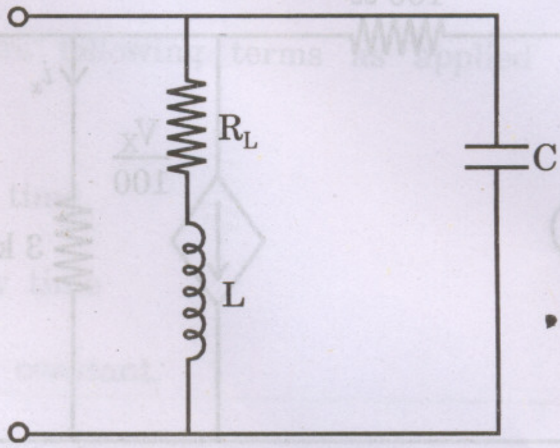

Fig. 4(*b*)

(c) A parallel resonant circuit has a coil of 150 μH with Q of 60 and resonated at 1 MHz.

(i) Specify the value of required capacitor.

(ii) What is the circuit impedance at resonance ?

(iii) What is the resistance of inductor ?

(iv) If Q is reduced to 4 by adding additional series resistance, then how much resistance is needed ? [6]

5. (a) For the circuit shown in Fig. 5(a) switch 'S' has been open for a long time. On closing 'S' the capacitor attains a value of 80 V after 10 ms. The S/W has been closed for long time. When 'S' is opened V_C = 90 V after half a second. Calculate R and C values. [6]

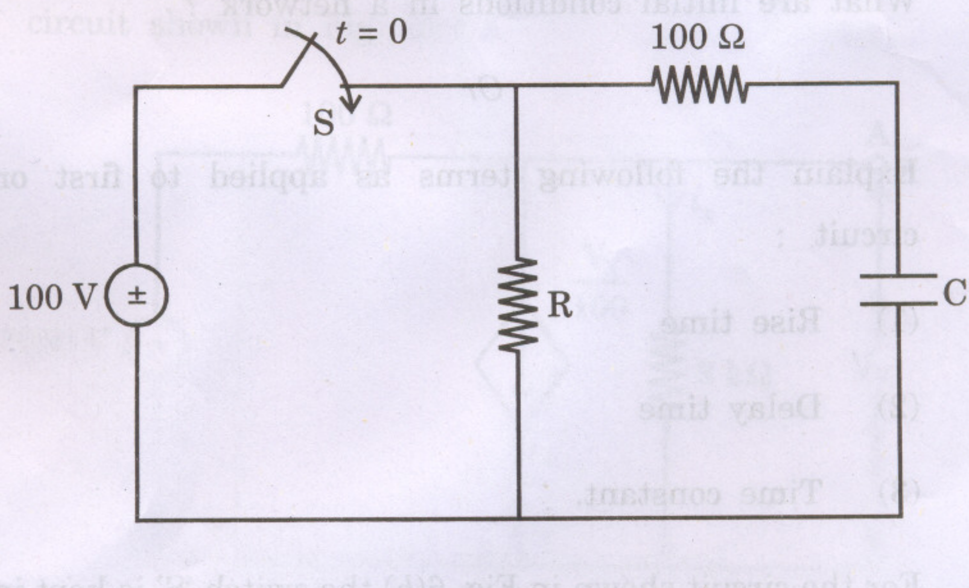

Fig. 5(a)

(*b*) The circuit shown in Fig. 5(*b*) was in steady state with switch on position 1. At $t = 0$ it is moved to position 2. Find $i(t)$ using Laplace transform. [6]

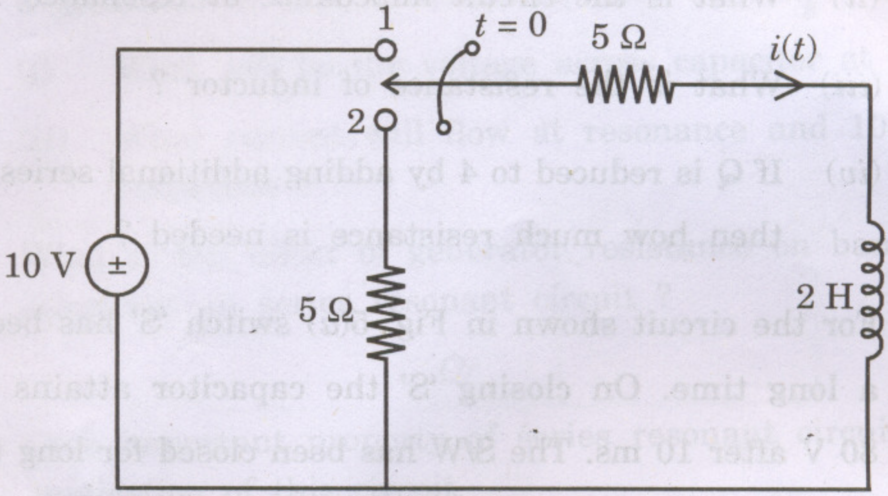

Fig. 5(*b*)

(*c*) What are initial conditions in a network ? [4]

Or

6. (*a*) Explain the following terms as applied to first order R-C circuit :

(1) Rise time

(2) Delay time

(3) Time constant. [4]

(*b*) For the circuit shown in Fig. 6(*b*) the switch 'S' is kept in position 1 for long period to establish steady state conditions. The switch is then shifted to position 2 at $t = 0$. Find out the expression for current after switching the switch to position 2. [6]

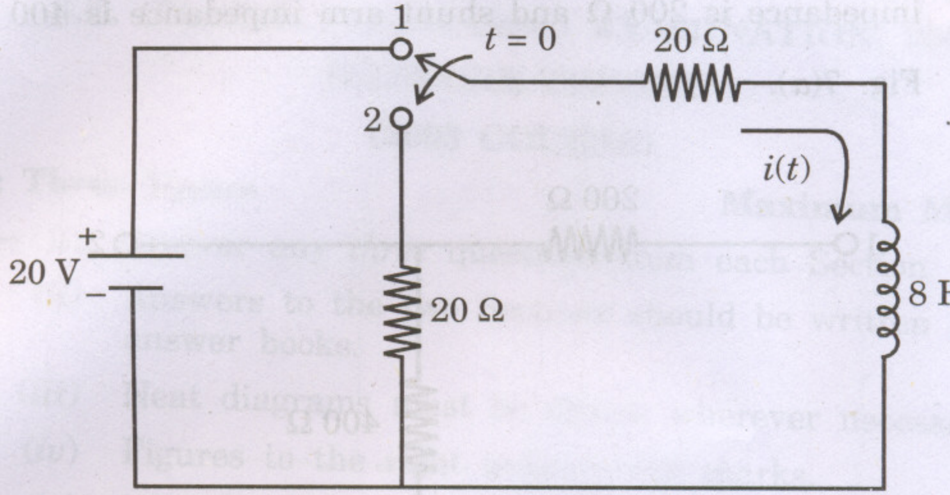

Fig. 6(*b*)

(*c*) In the network shown in Fig. 6(*c*) the switch K is moved from position '*a*' to '*b*' at $t = 0$ (a steady state existing in position '*a*' before $t = 0$). Solve for the current $i(t)$, using Laplace transform. [6]

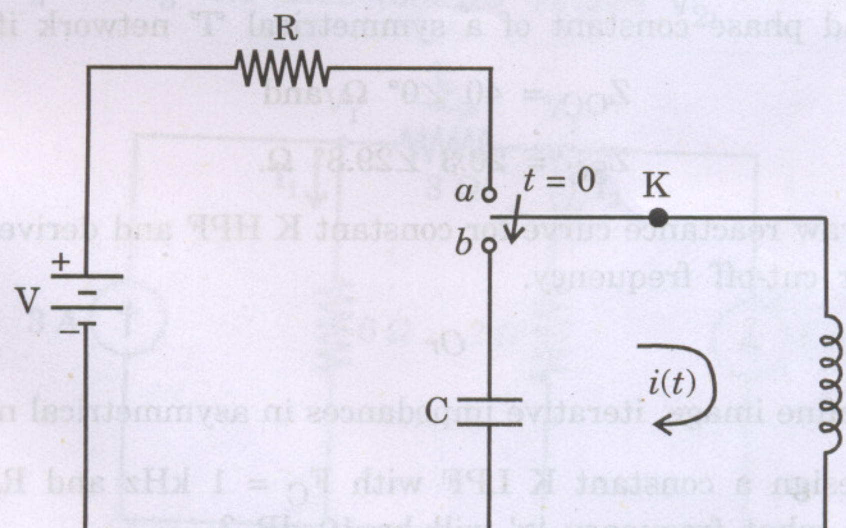

Fig. 6(*c*)

SECTION II

7. (*a*) Find an iterative impedance for L section whose series arm impedance is 200 Ω and shunt arm impedance is 400 Ω. Refer Fig. 7(*a*). [6]

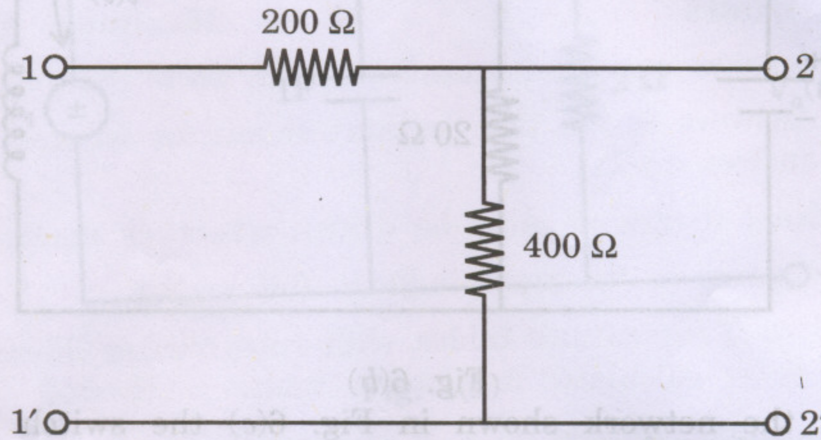

Fig. 7(*a*)

(*b*) Calculate the characteristic impedance, an attenuation constant and phase constant of a symmetrical 'T' network if,

$$Z_{OC} = 40 \angle 0° \ \Omega \text{ and}$$

$$Z_{SC} = 20.3 \angle 29.8° \ \Omega.$$ [6]

(*c*) Draw reactance curve for constant K HPF and derive expression for cut-off frequency. [4]

Or

8. (*a*) Define image, iterative impedances in asymmetrical network. [4]

(*b*) Design a constant K LPF with F_C = 1 kHz and R_0 = 600 Ω. At what frequency 'α' will be 10 dB ? [6]

(*c*) Design π type attenuater to provide attenuation of 10 dB and working into characteristic impedance of 600 Ω. [6]

9. (*a*) State the necessary condition for driving point functions. [4]

(*b*) For the circuit shown in Fig. 9(*b*), find the driving point impedance and driving point admittance. [6]

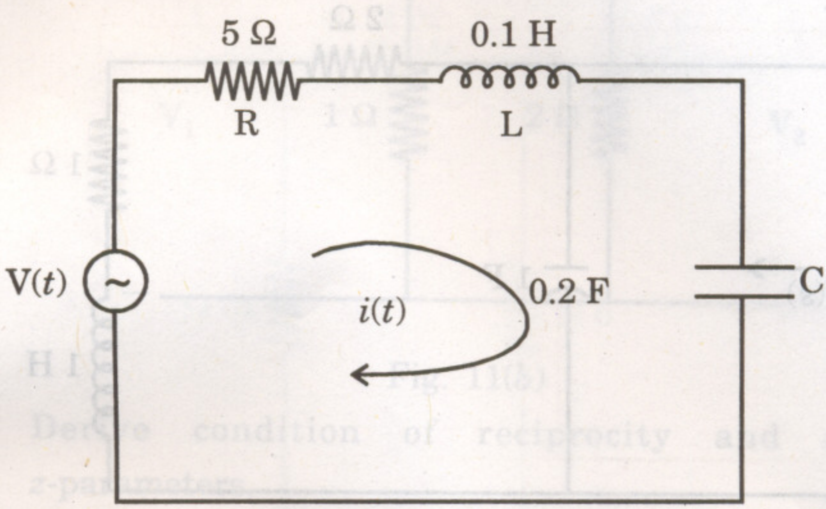

Fig. 9(*b*)

(*c*) Find input impedance $Z_{in}(S)$ and plot its poles and zeros for the circuit shown in Fig. 9(*c*). [6]

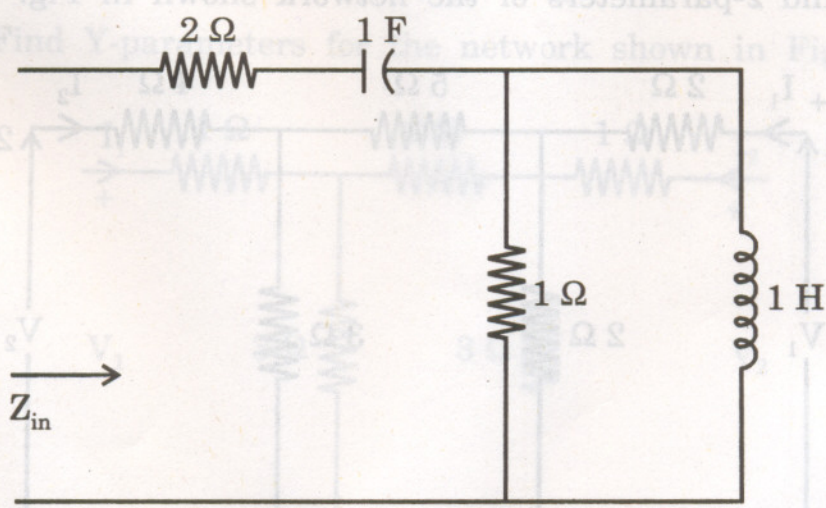

Fig. 9(*c*)

10. (*a*) Explain significance of poles and zeros. [4]

(*b*) Find driving point impedance and driving point admittance for the circuit shown in Fig. 10(*b*). [6]

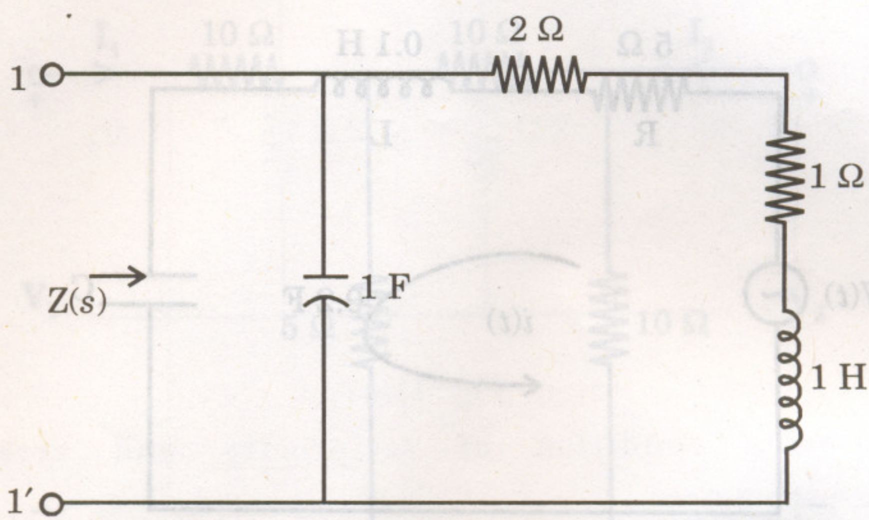

Fig. 10(*b*)

(*c*) Draw pole zero plot for following function :

$$H(s) = \frac{s^2 + 4}{s^2 + 6s + 4}.$$ [6]

11. (*a*) Find *z*-parameters of the network shown in Fig. 11(*a*). [6]

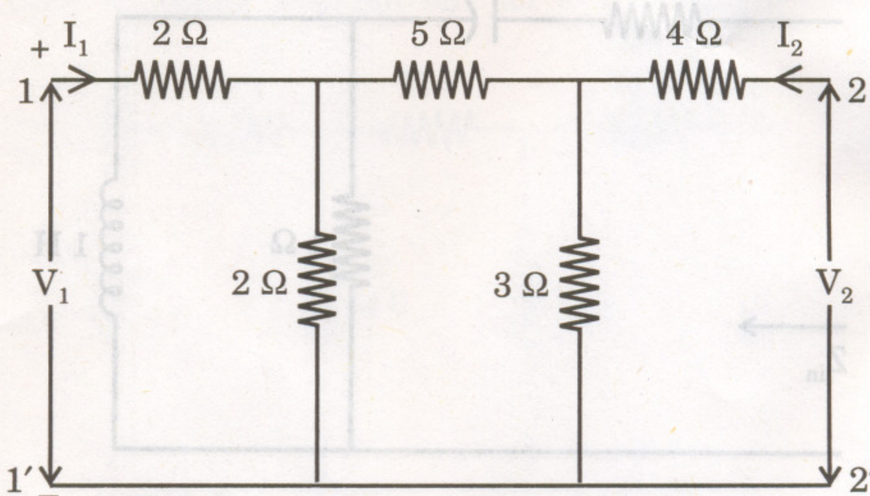

Fig. 11(*a*)

(*b*) Find *h*-parameters for the network shown in Fig. 11(*b*). [6]

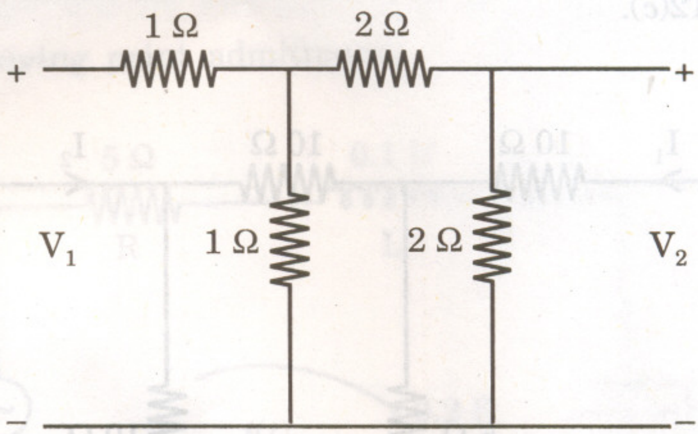

Fig. 11(*b*)

(*c*) Derive condition of reciprocity and symmetry for *z*-parameters. [6]

Or

12. (*a*) State wheather the following function is suitable for driving point function analysis :

$$Z(s) = \frac{5\left(4s^3 + 2s^2 + s + 2\right)}{s^4 + 3s^3 + 4s}. \quad [4]$$

(*b*) Find Y-parameters for the network shown in Fig. 12(*b*). [8]

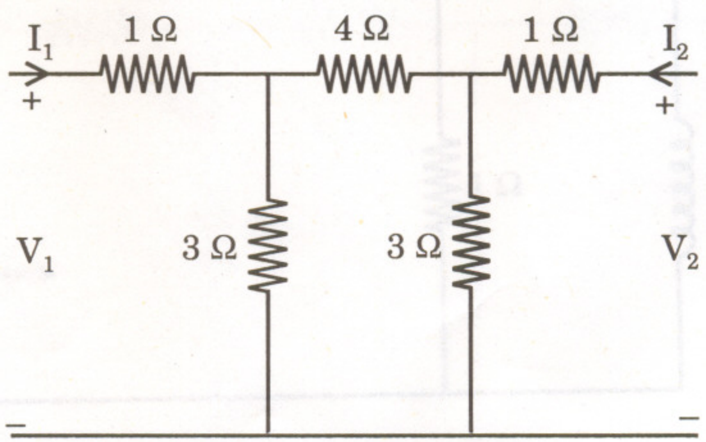

Fig. 12(*b*)

(c) Determine transmission parameter of the network shown in Fig. 12(c). [6]

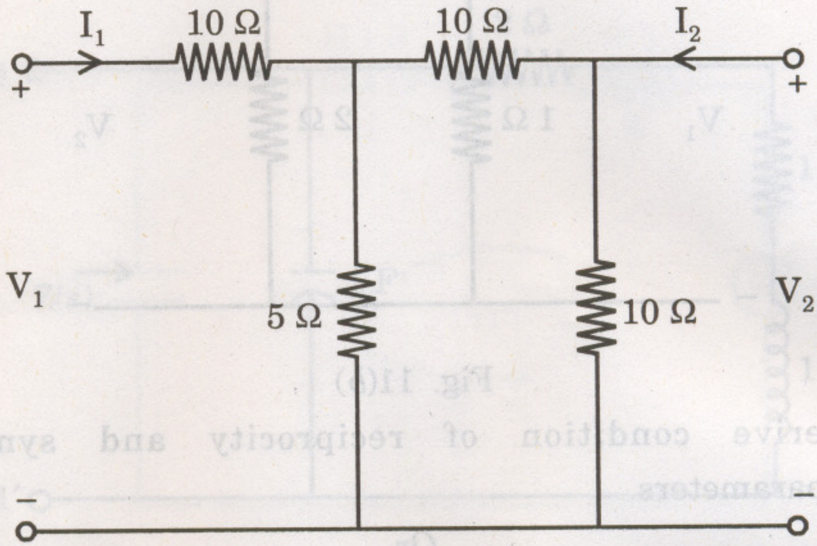

Fig. 12(c)

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S.E. (Electronics) (Second Sem.) EXAMINATION, 2008

ELECTRICAL CIRCUITS AND MACHINES

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare merits and demerits of O.C. and S.C. tests and direct loading test used to determine the performance of a single phase transformer. If these three tests are to be carried out on a single phase, 2 kVA, 220 V/110 V, 50 Hz transformer, draw circuit diagrams mentioning the rating of each apparatus used. [8]

(b) Obtain the approximate equivalent circuit parameters of 200/400 volts, 50 Hz, single phase transformers form the following test results :

O.C. test : 200 volts, 0.7 amps, 77 watts on L.V. side

S.C. test : 12 volts, 10 amps, 100 watts on H.V. side

Also calculate the secondary voltage when delivering 5 kW at 0.5 lagging power factor, the primary voltage being 200 volts. [8]

Or

2. (a) Compare 1-phase auto-transformer with 1-phase, 2-winding transformer. Derive the expression for copper saving. When is the saving maximum ? [8]

(b) Write a short note on different transformer connections. Discuss their applications. [8]

3. (a) Derive the e.m.f. equation of the d.c. machine. State clearly the meaning and units of the symbol used. [8]

(b) State and explain the conditions under which the self-excited shunt generator would fail to develop the rated terminal voltage. [8]

Or

4. (a) Explain the Plugging and Rheostatic braking applied to d.c. shunt motor. [8]

(b) A 230 V, shunt motor takes 5 Amp, on no load and runs at 750 r.p.m Its shunt field and armature resistance are 115 ohm and 0.25 respectively. Calculate the speed of the motor when loaded and taking a current of 55 Amp. Assume that the flux becomes weak by 4% under load condition. [8]

5. (a) What are the causes of low power factor ? Explain the method of measuring reactive power in a balanced 3-phase, 3-wire circuit by means of one wattmeter. [10]

(b) A wattmeter read 10.50 kW, when its current coil is connected in R phase and a voltage coil is connected between R and Y phase of a 3-phase system supplying a balance star connected load of 30 Amp at 415 V. What will be the reading of the wattmeter if voltage coil is connected between Y and B phase keeping current coil in R phase ? [8]

Or

6. (a) Explain the use of C.T. and P.T. in :

(1) Single phase power measurement

(2) Three phase power measurement. [8]

(b) Explain the effect of power factor on two wattmeter readings. [4]

(c) What is energy audit ? Explain its importance. [6]

SECTION II

7. (*a*) Why starter is required for 3-phase induction motor ? Explain with neat diagram star-delta starter of 3-phase induction motor. [8]

(*b*) Explain the effects of slip on the following rotor parameters :

(*i*) Frequency

(*ii*) Induced e.m.f.

(*iii*) Power factor

(*iv*) Impedance. [8]

Or

8. (*a*) Explain speed control methods of 3-phase induction motor. [8]

(*b*) A 440 V, 50 Hz, 6-pole, 3-phase induction motor delivers a mechanical load of 15 kW at 950 r.p.m. with a power factor of 0.84. The mechanical losses are 0.75 kW. Calculate for this load :

(*i*) Slip

(*ii*) Rotor copper loss

(*iii*) Input power if the stator losses are 1.5 kW.

(*iv*) The line current. [8]

9. (*a*) Define and derive the expressions for :

(*i*) Pitch factor

(*ii*) Distribution factor

for an alternator. [8]

(*b*) What is voltage regulation ? Discuss the synchronous impedance method of calculating voltage regulation. [8]

Or

10. (*a*) With experiment setup explain how to obtain V-curves of synchronous motors. [8]

(*b*) Explain the effect of variable excitation on the behaviour of the synchronous motor under constant load condition. [8]

11. (*a*) Explain the double field revolving theory of single phase induction motor. [6]

(*b*) Explain the characteristics of universal motor. [6]

(*c*) With the help of neat diagrams explain the operation of the capacitor start induction motors. [6]

Or

12. Write short notes on any *three* : [18]

(*i*) A.C. servo motor

(*ii*) Hysteresis motor

(*iii*) Stepper motor

(*iv*) Variable reluctance motor.

Total No. of Questions—12] [Total No. of Printed Pages—4+1

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S.E. (E&TC) (Second Semester) EXAMINATION, 2008

DATA STRUCTURES AND FILES

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Attempt Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6** from Section I and Q. **7** *or* Q. **8**, Q. **9** *or* Q. **10**, Q. **11** *or* Q. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Write a function in 'C' using pointers, to add two matrices and return the resultant matrix to calling function. [6]

(*b*) Write a function in 'C' using pointers for checking whether two strings are equal or not. [6]

(*c*) Explain with suitable example, a function call by reference and function call by value. [4]

P.T.O.

Or

2. (*a*) State the advantages and disadvantages of the following file organizations :

   (*i*) Sequential

   (*ii*) Direct access

   (*iii*) Simple index. [8]

   (*b*) What is the purpose of structure in 'C' ? Can we define the structure into structure ? Give suitable example. [8]

3. (*a*) Explain the following terms :

   Data object, data type, data structure and data representation. Also comment on their inter-relationship. [4]

   (*b*) Give the algorithm for searching any element from given set of '*n*' elements, using Binary search method. Comment on the time complexity of the algorithm. [6]

   (*c*) Write a note on Hashing. Give *two* examples of Hash functions. What are the characteristics of a good Hashing function ? Explain with example rehashing. [8]

Or

4. (*a*) Define the term ADT. Give ADT for stack. [4]

   (*b*) Short the following list of numbers using quick sort. Show the output of every pass. Comment on space and time complexity of the algorithm.

   22, 5, 10, 99, 80, 75, 30, 25, 10, 3. [8]

(c) What is meant by an ordered list ? Explain with example how a polynomial in a single variable can be represented as an ordered list. Mention at least *two* ways and compare their representations. [6]

5. (a) Give a node structure for singly linked list. Write a function in 'C', to add a node in a singly linked list which is maintained in ascending order of a numeric value. Function should handle the following cases :

(1) Insertion at the beginning of a SLL.

(2) Insertion at the end of SLL.

(3) Insertion in the middle. [10]

(b) Write a function in 'C', to invert the singly linked list without creating a new node and without swapping the data. Assume that the list contains numerical data. [6]

Or

6. (a) Write a function in 'C' to delete a node of doubly linked list, where '*p*' denotes the pointer to the node to be deleted. [4]

(b) Explain the term — GLL by taking appropriate example. With the help of example, show how a polynomial in a multivariable can be represented using GLL. [4]

(*c*) Let '*p*' be a pointer to head node of one SLL and '*q*' be a pointer to head node of second SLL. Write a function in 'C' to merge the two SLL's in the following manner :

$p_1 \rightarrow q_1 \rightarrow p_2 \rightarrow q_2 \rightarrow p_3 \rightarrow q_3 \rightarrow ..... \rightarrow p_n \rightarrow q_n$

where p_1 ..... p_n are nodes of 1st SLL

and q_1 ..... q_n are nodes of 2nd SLL. [8]

SECTION II

7. (*a*) Convert the following expressions in other two forms, where $ stands for unary minus :

(*i*) ab + cd − *

(*ii*) $a + (b − c) ↑ D

(*iii*) / − * abc + ef

(*iv*) $a + p ↑ q ↑ r. [8]

(*b*) Give an algorithm for evolution of a postfix expression. [8]

Or

8. (*a*) Differentiate between circular and linear queue. [4]

(*b*) Explain the term priority queue and give the application for the same. [4]

(*c*) Implement the following functions in 'C' to implement circular queue using array :

(*i*) Insert an element

(*ii*) Delete an element

(*iii*) Queue full

(*iv*) Queue empty.

Assume data elements to be integer. [8]

9. (*a*) Write a non-recursive algorithm for pre-order traversal of a binary tree. [6]

(*b*) Write recursive functions to obtain :

(*i*) height of a binary tree

(*ii*) to count and print the leaf nodes of a binary tree. [6]

(*c*) The post order and inorder traversals of a binary tree are given below. Is it possible to obtain a unique binary tree from these traversals. If yes obtain the tree, if not give justification.

Inorder Traversal — D, B, F, E, G, A, H, I, C

Post order Traversal — D, F, G, E, B, I, H, C, A. [6]

Or

10. (*a*) Define binary search tree. Write a function to delete a node from a BST. Consider all possible cases. [10]

(*b*) List the advantages of using a threaded binary tree. Give node structure for defining a threaded binary tree. Write a function in 'C' to find the pre-order successor of any node pointed by '*p*' in a threaded binary tree. [8]

11. (*a*) Write a function in 'C' to find the minimum spanning tree using Kruskal's algorithm. Derive its time complexity. [12]

(*b*) With the help of any graph, explain the terms adjacency list and adjacency matrix. [4]

Or

12. (*a*) Write a recursive function to find DFS of a graph. [4]

(*b*) Explain the algorithm to find the shortest path between two vertices of a graph. [12]

Total No. of Questions—12] [Total No. of Printed Pages—4+2

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S.E. (Electronics/Electronics and Telecomm.)

(Second Semester) EXAMINATION, 2008

ANALOG COMMUNICATION

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from each Section.

(*ii*) Answer to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain various types of electronic communications. Give example of each. [8]

(*b*) Specify the range of frequencies and one application used in the following RF-band : [4]

(*i*) Super high

(*ii*) Low frequencies

(*iii*) Very high frequencies

(*iv*) Infrared.

(*c*) Draw and explain with block schematic the generation of pulse position modulation technique. [4]

Or

2. (*a*) What is need of multiplexing ? Explain the concept of frequency division multiplexing and demultiplexing with neat block schematic. Draw the spectrum of FDM signal. [8]

(*b*) State various types of communication channels with their supported data rate, bandwidth required and application for each. [4]

(*c*) Explain with examples, the term baseband signal. State bandwidth requirement of baseband signal. [4]

3. (*a*) An amplitude modulated signal is given by :

$$\phi_{AM}(t) = 10 \cos (2\pi \times 10^6 t) + 5 \cos (2\pi \times 10^6 t) \cos (2\pi \times 10^3 t) + 2 \cos (2\pi \times 10^6 t) \cos (4\pi \times 10^3 t) \text{ volts.}$$

Find various frequency components present and the corresponding modulation indices. Draw line spectrum and find bandwidth. Also calculate total modulation index and total modulated power. [10]

(*b*) Explain in detail DSBSC generation using diode lattice type balanced modulator. [8]

Or

4. (*a*) With a neat block diagram, explain basic high level AM transmitter and compare it with low level transmitter. [10]

(*b*) What is a significance of VSB transmission. Compare this technique with other transmission techniques in terms of bandwidth, transmission power and complexity. [8]

5. (*a*) An Armstrong FM system uses primary oscillator of 1 MHz, maximum phase deviation is restricted to 10°, when minimum modulating frequency is 100 Hz. Calculate :

(*i*) Frequency deviation;

(*ii*) Starting with the above modulator, the transmitter is to work at 120 MHz, with maximum frequency deviation of 30 kHz. What is the multiplication factor needed ?

(*iii*) If any doublers and triplers are to be used, which is the best combination to achieve the multiplication ? [8]

(*b*) What is the need of pre-emphasis in FM ? Explain pre-emphasis and de-emphasis filter with their respective frequency response. [8]

6. (*a*) An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^6$ is described by the equation :

$$\phi_{EM}(t) = 5 \cos (\omega_c t + 20 \sin 1000\pi t + 10 \sin 2000\pi t).$$

(*i*) Find power of modulating signal.

(*ii*) Find frequency deviation

(*iii*) Phase deviation

(*iv*) Estimate the bandwidth. [8]

(*b*) Explain with neat diagram generation of FM using reactance modulator. [6]

(*c*) Explain with example, why frequency modulation is sometimes referred to as constant bandwidth system. [2]

SECTION II

7. (*a*) Explain with neat block schematic the working of double conversion superheterodyne radio receiver. Draw the response at various stages. [8]

(*b*) Why Squelch circuit is used in radio receiver ? Draw and explain in brief the Squelch circuit. [4]

(*c*) An AM broadcast receiver has an IF of 465 kHz and is tuned to 1000 kHz and the RF stage has one tuned circuit with Q of 50 : [4]

(*i*) Find the image frequency

(*ii*) Find image rejection in dB.

Or

8. (*a*) Explain in brief performance characteristics of radio receiver. Give the typical values of good radio receiver for every characteristics. [8]

(*b*) Explain the difference between simple and delayed AGC. [4]

(*c*) A receiver tunes signal from 550 kHz to 1600 kHz with an IF of 455 kHz. Find frequency tunning ranger for oscillator section and for RF section. [4]

9. (*a*) For a receiver with :

$$Ga_1 = 30 \text{ dB}, \; Ga_2 = 20 \text{ dB and } Ga_3 = 40 \text{ dB}$$

are gain of three stages say master amplifier, TWT and mixer stage. The effective temperature of first stage is 5°K with $F_2 = 4$ and $F_3 = 16$ for second and third stage respectively. Evaluate :

(*i*) overall noise figure

(*ii*) overall equivalent temperature of receiver.

Assume that ambient temperature = 17°C. [8]

(*b*) Explain in brief the term shot noise. Calculate the shot noise component of current present on a direct current of 1 mA flowing across a semiconductor junction. Given that the effective noise bandwidth is 1 MHz. [8]

Or

10. (*a*) Explain the performance of SSBSC in presence of noise. [8]

(*b*) The equivalent noise resistance of amplifier is 300 Ω and equivalent shot noise current is 5 μA. The amplifier is fed from 150 Ω, 10 μV. r.m.s. sinusoidal signal source, calculate individual noise voltage at the input and input 5 NR in dB. The noise bandwidth is 10 MHz. [8]

11. (*a*) Explain the following terms with respect to Antenna : [8]

(*i*) Antenna beamwidth

(*ii*) Antenna resistance

(*iii*) Antenna efficiency

(*iv*) Radiation pattern of Antenna.

(*b*) Describe ground wave propagation. What is the angle of tilt ? How does it affect field strength at a distance from the transmitter. [8]

Or

12. (*a*) Explain sky wave propagation and compare it with other types of propagation. [8]

(*b*) Explain the following terms : [8]

(*i*) Virtual height

(*ii*) Critical frequency

(*iii*) Skip zone

(*iv*) Fading

with respect to sky wave propagation.