QPcode: 10082083

SE Sem III rd Electrical R-19 cscheme

**Time: 3 hours** **Max. Marks: 80**

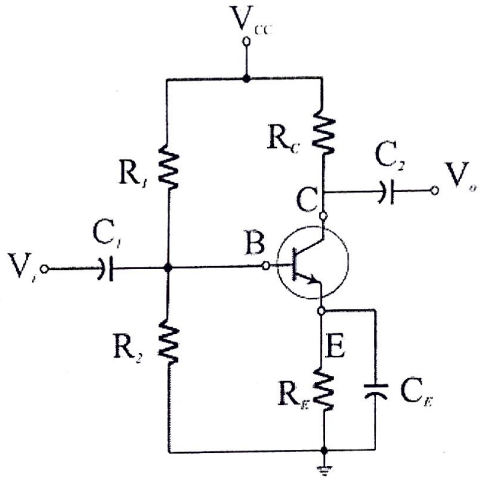
Q1) Answer **any four** of the following (entire syllabus)

| | | |
|---|---|---|
| **a.** | Explain basic construction and operation of diode | **(05)** |
| **b.** | Explain BJT as an amplifier. | **(05)** |
| **c.** | Explain the operation of E-MOSFET. | **(05)** |
| **d.** | Explain the frequency response of an operational amplifier. | **(05)** |
| **e.** | Draw a functional block diagram of IC 555 | **(05)** |
| **f.** | Explain the operation of LED. | **(05)** |

Q2)

**a.** Analyse full-wave bridge wave rectifier along with 'LC' filter. Analyse the impact of 'LC'filer over the ripple factor. **(10)**

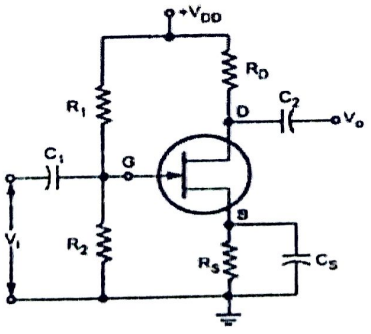
**b.** Calculate the Q point in the following circuit of BJT CE voltage divider bias.Given Data: $V_{CC}$=18 V, $R_1$= 50KΩ, $R_2$=10KΩ, $R_C$=3.3KΩ, $R_E$=1KΩ, β=100 **(10)**




Q3)

**a.** Perform small-signal analysis over a BJT CE amplifier with voltage divider bias using the h-model. Derive an expression for current gain, input impedance, voltage gain and output impedance. **(10)**

b. Find $I_{DQ}$, $V_{GSQ}$, $V_D$, and $V_{DS}$ in the given circuit. Given Data:$V_{DD}$=18 V, $R_1$= 110MΩ, $R_2$=10MΩ, $R_D$=1.82KΩ, $R_S$=750Ω,$I_{DSS}$= 6 mA, $V_P$=$V_{GS(off)}$= -3V **(10)**



Q4)

**a.** Derive expressions for voltage gain and output impedance of MOSFET CS (Voltage divider bias) amplifier circuit. **(10)**

**b.** Explain Op-Amp as Schmitt trigger. **(10)**

Q5)

**a.** Explain Op-Amp as a zero crossing detector. **(10)**

**b.** Design a voltage regulator using IC LM 317 to produce an output voltage of 10 volts. **(10)**

Q6)

**a.** Write a short note on a Zener diode and an opto-isolator. **(10)**

**b.** Explain Op-Amp as a first-order low-pass filter. **(10)**

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QPcode: 10085660

SE Sem III Rev Electrical R-19 CS scheme

**Duration – 3 Hours** **Total Marks - 80**

**N.B.: -** (1) Question No.1 is compulsory.
(2) **Attempt** any **Three** questions out of the remaining **five** questions.
(3) Assume suitable data if necessary and justify the same.

Q 1. **Answer any four questions.**

A) Discuss in details skin effect with a neat diagram **05**

B) State the advantages and disadvantages of Solar cell power generation **05**

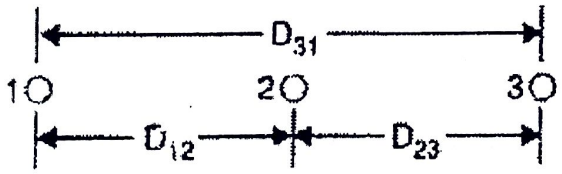
C) Derive the expression for the insulation resistance of a single core cable. **05**

D) Define string efficiency? Illustrate the any one method of improving string efficiency **05**

E) State the steps to calculate the self GMD of three phase double circuit line. **05**

Q 2 a) A 20km single phase line has two parallel conductors separated by 1.5m.The diameter of each conductor is 0.823cm.If the conductor has resistance of 0.311ohm/km.Find the loop impedance of this at 50 Hz. **10**

Q 2 b) Calculate the inductive reactance of each conductor in a 3 phase, 3 wire line of 80km, when the conductors are arranged in horizontal plane with spacing such that D31=4m, D12=D23=2m.The conductors are transposed and have a diameter of 2.5cm. **10**




Q 3 a) A 3phase ,132 kV,100km, 50Hz, single circuit line has equilateral spacing with 3.5m between conductors. The conductor diameter is 1.2 cm. Calculate **10**
(i) line to neutral capacitance per phase per km
(ii) Charging current per phase
(iii) Charging MVA

Q 3 b) Derive the expression for capacitance of three phase transmission line with unsymmetrical spacing **10**

Q 4 a) Define medium transmission line nominal pi model.Draw the equivalent circuit representation. Derive the expression for regulation and efficiency of medium transmission line Nominalpi method. State the expressions for its A, B, C, D constants also, analyse its validity for two port network. **10**

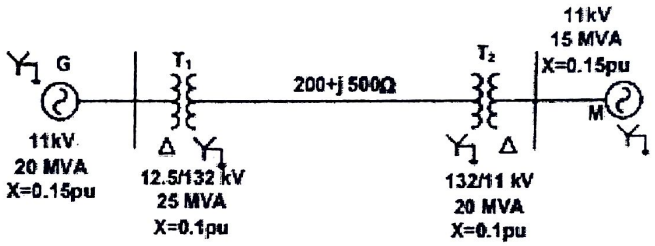
Q 4 b) An overhead 3-phase transmission line delivers 5000kW at 22kV at 0.8pf lagging. The resistance and reactance of each conductor is 4 ohm and 6 ohm respectively. Determine sending end voltage , percentage regulation and transmission efficiency. **10**

Q 5 a) Develop the expression of string efficiency for 2 disc insulators string. **10**

Q 5 b) The three bus-bar conductors in an outdoor substation are supported by units of post type insulators. Each unit consists of a stack of 3 pin type insulators fixed one on the top of the other. The voltage across the lowest insulator is 13.1 kV and that across the next unit is 11 kV. Find the bus-bar voltage of the station. Also calculate the string efficiency **10**

Q 6 a) .Write short note on following (i) step and touch potential (ii) neutral grounding and its method. **10**

Q 6 b) Draw p.u. impedance diagram for the system as shown. Choose base voltage of 11kV and Base MVA as 20 MVA for Generator G. **10**



SE|sem III| R-19 c-scheme|Electrical QP - 10081957

**Duration – 3 Hours** **Total marks- 80**

Note: - (1) Question No.1 is compulsory.
(2) Attempt any three questions out of the remaining five questions.
(3) Assume suitable data if necessary and justify the same.

| | | |
|---|---|---|
| **Q 1** | **Answer the following questions.** | **20M** |
| | a) What is back emf? Explain the significance of back emf in case of DC Motor | **5M** |
| | b) Differentiate between active and passive transducers. Give examples of each. | **5M** |
| | c) Explain i) Magnetic Flux Density ii) Reluctance iii) Magnetic saturation. | **5M** |
| | d) Which three torques are required for satisfactory operation of analog indicating instrument? State the function of each torque. | **5M** |
| **Q 2 (a)** | Explain in brief the principle of electro-mechanical energy conversion and develop a model of electro-mechanical energy conversion device. | **10M** |
| **Q 2 (b)** | A 200 V dc series motor runs at 1000 rpm and takes 20A. Combined resistance of armature and field is 0.4 ohm. Calculate the resistance to be inserted in series so as to reduce the speed to 800 rpm, assuming torque to vary as square of the speed and linear magnetization curve. | **10M** |
| **Q 3 (a)** | Explain the concept of the energy stored in the magnetic field. Also derive the expression for the energy stored in the magnetic field. | **10M** |
| **Q 3 (b)** | Explain the measurement of unknown resistance using Kelvin's double bridge. | **10M** |
| **Q 4 (a)** | Describe construction, working principle and theory of dynamometer type wattmeter. | **10M** |
| **Q 4 (b)** | Explain with diagram the construction and working principle of LVDT. What are the applications of LVDT? | **10M** |
| **Q 5 (a)** | Explain the construction and working principle of digital Tachometer. | **10M** |
| **Q 5 (b)** | Explain with phasor diagram how Schering bridge can used to measure unknown capacitor. | **10M** |
| **Q 6 (a)** | Explain the Hopkinson's test with neat diagram. | **10M** |
| **Q 6 (b)** | Draw and explain working of successive approximation type digital voltmeter | **10M** |

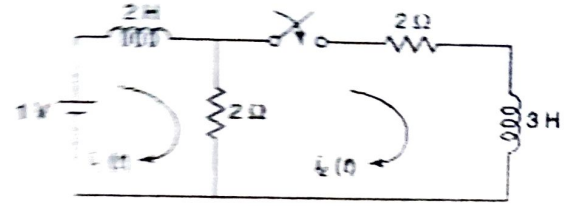
SE / Sem III / R-19 C-Scheme / Electrical Engineering (KT)

**Marks: 80**

- Question No. 1 is compulsory.
- Answer any three from the remaining five questions.
- Assume suitable data if necessary and justify the same.

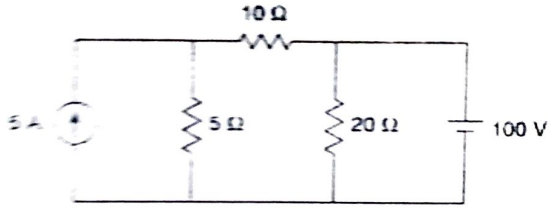
1(a) Each question carries five marks. 20M

i. In the given network, assuming all initial conditions as zero, find $i_1$, $i_2$ at $t=0+$.



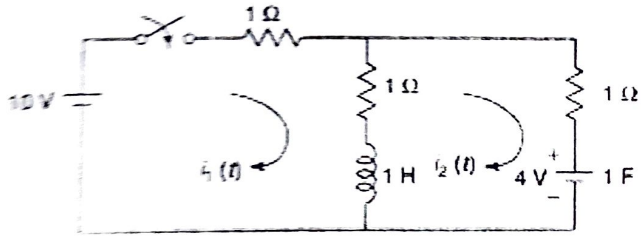

ii. Derive the condition for reciprocity and symmetry for ABCD-parameters.

iii. Determine the current through the 20 ohm in the following circuit

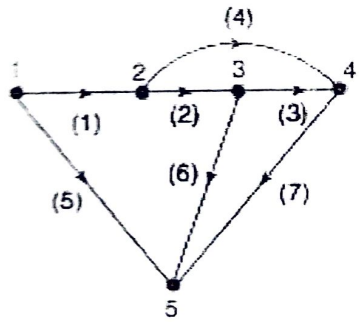



iv. Obtain the pole-zero plot of the function $F(s)=\frac{s(s+6)}{(s+1)(s+5)}$

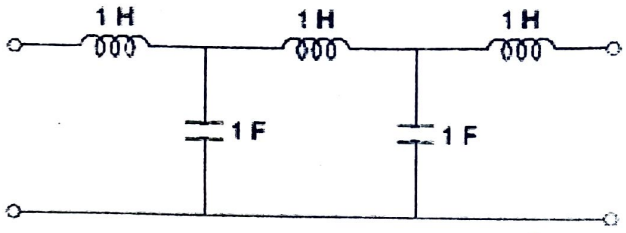
1(b) i. For the network shown, the switch is closed at t = 0. Find the currents $i_1(t)$ and $i_2(t)$, when initial current through the inductor is zero and initial voltage on the capacitor is 4V, using Laplace Transform. 10M



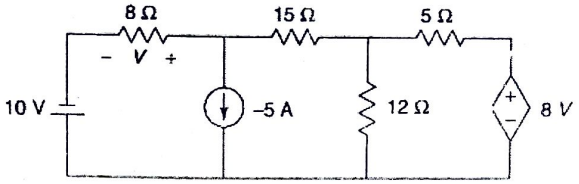

ii. For the given graph, write the incidence matrix, tieset matrix and f-cutset matrix. 10M



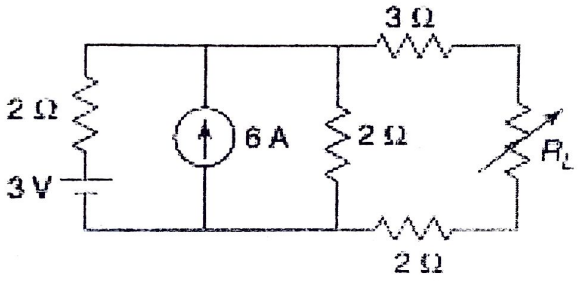
Q3 a Determine the transmission parameters of the network shown using the concept of interconnection of two two-port networks. 10



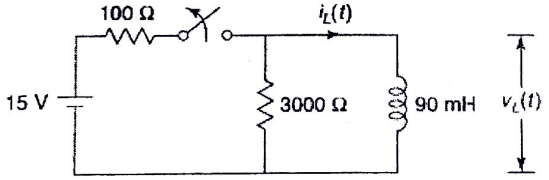

b Find the voltage V using superposition theorem. 10M



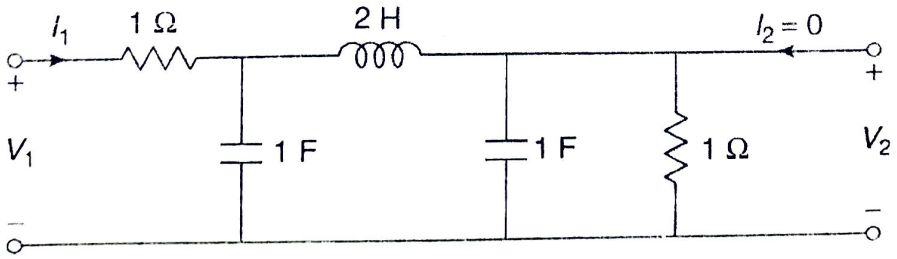

Q4 a Find the value of the resistance $R_L$ for maximum power transfer and calculate the maximum power. 10M



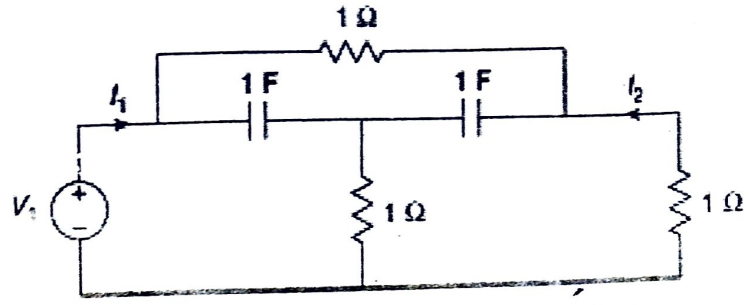

b For the following network, steady state is reached with the switch closed. The switch is opened at t = 0. Obtain expressions for $i_L$ (t) and $v_L$ (t). 10M



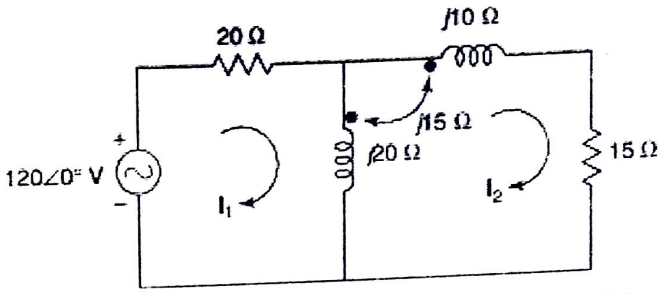

Q5 a For the given ladder network, determine the voltage transfer function V 2 /V 1. 10M



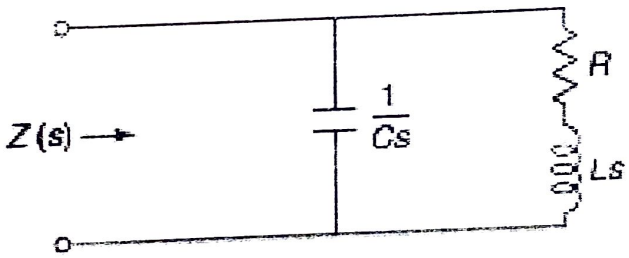
b For the given network, find the driving-point admittance $Y_{11}$ and transfer admittance $Y_{12}$ 10M




Q6 a Determine the voltage across the 15Ω resistor using mesh analysis. 10M




b For the given network, poles and zeros of driving point function Z(s) are, poles: (–1 ± j4); zero: –2. If Z (j0) = 1, find the values of R, L and C. 10M

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QP code: 10086009

SE sem-III Electrical R-19 C scheme

**Time: 3 hour** **Max. Marks: 80**

**Note: 1) Question 1 is compulsory.**
**2) Attempt any 3 questions from Question 2 to Question 6**
**3) Figures to the right indicate full marks.**

**1.**(a) Find the Laplace Transform of $f(t) = \int_0^t e^{-3u} sin4u\ du$. **(5)**

(b) If $A = \begin{bmatrix} 2 & 1 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 3 \end{bmatrix}$, find the eigen values of $A^2 - 2A + I$. **(5)**

(c) Find half-range sine series for $f(x) = \begin{cases} 1, & 0 < x < a/2 \\ -1, & \frac{a}{2} < x < a \end{cases}$. **(5)**

(d) Find the constants a, b, c, d, e if $f(z) = (ax^4 + bx^2y^2 + dx^2 + cy^4 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is analytic. **(5)**

**2.**(a) Evaluate $\int_0^\infty \frac{cosat - cosbt}{t} dt$ using Laplace Transform. **(6)**

(b) Show that the function $v = (x^4 - 6x^2y^2 + y^4) + (x^2 - y^2) + 2xy$ is harmonic and find the corresponding analytic function f(z) in terms of z. **(6)**

(c) Find the Fourier Series for $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2 - x), & 1 \le x \le 2 \end{cases}$, $x \in [0,2]$. **(8)**

**3.**(a) Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$. **(6)**

(b) Show that $\vec{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both solenoidal and irrotational. **(6)**

(c) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ hence find $A^{-1}$. **(8)**

**4.**(a) Use Stoke's Theorem to evaluate $\int \vec{F}.\vec{dr}$ where $\vec{F} = (2x - y)i - yz^2j - y^2zk$ and S is the surface of the hemisphere $x^2 + y^2 + z^2 = a^2$, *lying above xy plane.* **(6)**

(b) Find the inverse Laplace Transform of $\frac{s+2}{s^2(s+3)}$. **(6)**

(c) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable. Find the transforming and diagonal matrix. **(8)**

**5.**(a) Find the Fourier Series for $f(x) = x^2, -\pi \leq x \leq \pi$. **(6)**

(b) Find $L\{cosht \int_0^t e^u \, coshu \, du\}$ **(6)**

(c) Find $L^{-}\{\frac{1}{(s-a)(s+a)^2}\}$ using Convolution Theorem. **(8)**

**6.**(a) Evaluate by Green's theorem $\int (x^2 - y)dx + (y^2 + x)dy)$ over the closed curve C of the region bounded by $y = 4 \; and \; y = x^2$. **(6)**

(b) Find the inverse Laplace Transform of $log\left(1 + \frac{a^2}{s^2}\right)$.. **(6)**

(c) Find the eigen values and eigen vectors of $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ **(8)**