e/Sem-III (Choice Based)/INST/Applied Mathematics-III/

Q.P. Code: 25474 Nov-2017

Duration: 3 Hours **Max. Marks: 80**

Note: 1. Questions No. 1 is compulsory.
2. Attempt any 3 Questions from the remaining questions.
3. Figures to the right indicate full marks.

Que. 1 a. Find the Laplace Transform of $e^{-4t}tcos2t.sin5t$. 5

b. Find the Fourier expansion for $f(x) = x$ in $(-\pi, \pi)$. 5

c. Prove that $\bar{F} = \frac{\bar{a}X\bar{r}}{r^n}$ is solenoidal where $\bar{a}$ is constant vector. 5

d. Find a , b ,c, d if $f(z)=(x^2+2axy+by^2)+i(cx^2+2dxy+y^2)$ is analytic. 5

Que. 2 a. If f(z)=u+ iv is analytic then show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)u^2 = 2|f'(z)|^2$ 6

b. By using convolution theorem, find the Inverse Laplace Transform of

$$\frac{s}{(s^2+4)(s^2+9)}$$ 6

c. Find Fourier series for $f(x) = x$; $0< x < 2$ and hence deduce that

$$\sum_{n=1}^{\infty}\frac{1}{(2n-1)^4} = \frac{\pi^4}{94}$$ 8

Que. 3 a. Prove that a vector field $\bar{F}$ is given by
$\bar{F} = (ysinz - sinx)i + (xsin\,z + 2yz)j + (xycosz + y^2)k$ is irrotational, hence find its scalar potential. 6

b. Find analytic function f(z) , whose imaginary part is $v = \frac{\sinh 2y}{\cosh 2y + \cos 2x}$ 6

c. By using Laplace transform, solve $y''+25y = 10\cos 2t$; $y(0)=2$, $y'(0) = 0$ 8

Que. 4 a. Find half range Fourier cosine series of the function

$f(x)=Lx - x^2$; $0 < x < L$ and hence deduce that $\sum_{n=1}^{\infty}\frac{1}{n^2} = \frac{\pi^2}{6}$, 6

b. Evaluate $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = (2x-y)i - yz^2j - y^2zk$, where is the boundary of the surface of hemisphere $x^2+y^2+z^2 = a^2$ lying above $xy-$plane. 6

c. Find Inverse Laplace Transform of a. $\frac{e^{4-3s}}{(s+4)^{5/2}}$ b. $\tan^{-1}(s+1)$ 8

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Que 5 a. Find the complex form of Fourier series of the following functions

$f(x)=e^{ax}, -\pi<x<\pi$ 6

b. Show that under the transformation $w=\frac{1}{z}$ the circle $(x-3)^2+y^2=2$ the circle is mapped to the circle $(u-\frac{3}{7})^2+v^2=\frac{2}{49}$ 6

c. Verify Green's Theorem in the plane for $\oint(x^2-y)dx+(2y^2+x)dy$ around boundary of the region defined by $y=2x^2$ and $y=2x$ 8

Que 6 a. By using Laplace transform, evaluate $\int_0^\infty \frac{\sin 2t+\sin 3t}{te^t}dt$ 6

b. Find a bilinear transformation which maps z = 2, i, -2 into w=1, i , -1 6

c. Find the Fourier integral representation of $f(x)=\begin{cases}e^{ax}, & x\le 0\\ e^{-ax}, & x\ge 0\end{cases}$ 8

and hence S.T. $\int_0^\infty \frac{\cos \lambda x}{\lambda^2+a^2}d\lambda=\frac{\pi}{2a}e^{-ax}$; $x>0, a>0$

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E/ Sem-III - Choice Based / INST / Analog Electronics / Nov-2017.

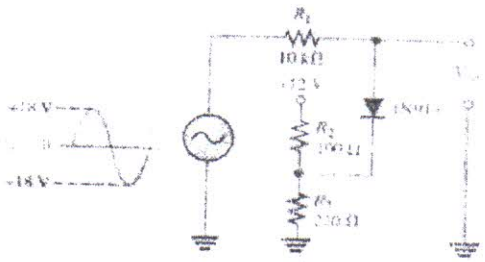
QP Code : 25991

Max. Time: 3 hr

Max. Marks: 80

Q.1 is compulsory (any Four). Attempt any 3 from Q.2 to Q.6

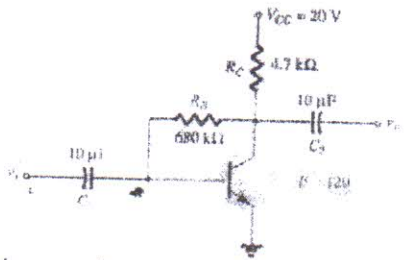
1(a) Describe the output voltage waveform for the diode limiter shown below (5)



1(b) Define a filter. How are filters classified? (5)

1(c) Explain Thermistor compensation with circuit diagram (5)

1(d) For the network of Fig. shown below determine I_C and V_{CE}, V_B, V_c



1(e) How FET be employed as a voltage controlled resistor. (5)

2(a) Determine the minimum value of R L to ensure that the Zener diode is in the "on" state (10)

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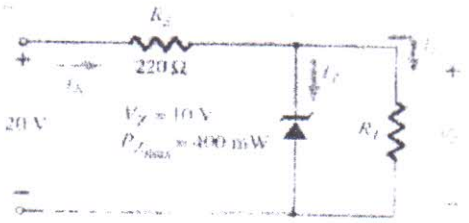
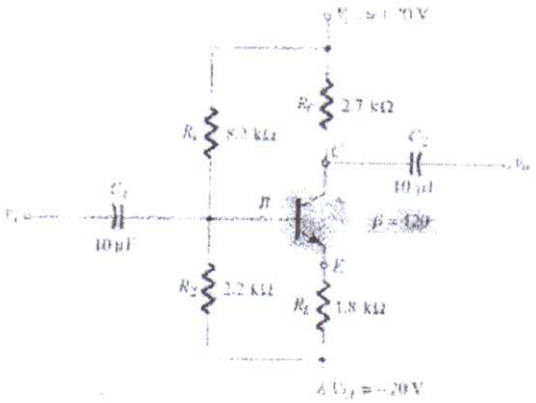


2(b) Compare class A, class B power amplifiers based on the output waveform for collector current, linearity, distortion and efficiency. (10)

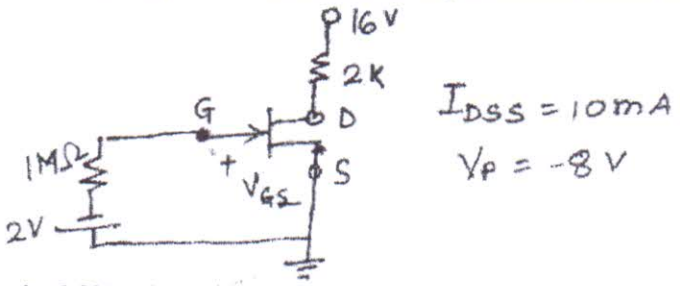
3(a) Determine V_C and V_B for the network of fig. shown below. (10)



3(b) Derive the expressions for the I_B, I_C and V_{CE} for emitter bias configuration of BJT. (10)

4(a) Explain the structure, operation and current-voltage characteristics of Enhancement type MOSFET. (10)

4(b) Determine V_{GS}, I_D, V_{DS} for the fixed Bias configuration as shown if fig below (10)



5(a) Using standard 5%resistances, design a circuit such that (10)

$$V_0 = -2(3v_1 + 2v_2 - 4v_3)$$

BE/INST/Sem-III [Choice Based] /Transducers -I/ Nov. 17

Q.P. Code : 27381

[Time: Three Hours] [Marks: 80]

N.B: 1. Question.No.1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data wherever necessary.

1 Attempt any four . 20

a What is base metal and rare metal thermocouples? State their advantages and disadvantages.

b The dead zone in a certain pyrometer is 0.125 %of span .The calibration is 400°C to 1000°C .
What temperature change might occur before it is detected?

c Classify transducers with suitable example.

d Explain absolute humidity and relative humidity.

e Explain liquid level measurement using float and LVDT with appropriate diagram .

2 a Explain different types of errors in measurements with their remedies. 10

b Explain flapper nozzle system and comment on its application. 10

3 a Explain radioactive type level detector in detail. 10

b A capacitive transducer uses two quartz diaphragms of area 750 mm^2 separated by a distance of 3.5 mm .A pressure of 900 kN/m^2 when applied to the top diaphragm produces a deflection of 0.6 mm .The capacitance is 370 pF when no pressure is applied to the diaphragms .Find the value of capacitance after the application of a pressure of 900 kN/m^2. 10

4 a State different types of pyrometers .Explain with a neat sketch any one of them. 10

b State and explain laws of intermediate temperature and intermediate metals of thermocouple. Write the significance of these laws. 10

5 a Explain construction and working principle of LVDT. 10

b A linear resistance potentiometer is 50 mm long and is uniformly wound with a wire having a resistance of 10KΩ. Under normal conditions, the slider is at the center of the potentiometer .Find the linear displacement when the resistance of the potentiometer as measured by a Wheatstone bridge for two cases is i) 3850Ω ii) 7560Ω. Are the two displacements in the same direction? If it is possible to measure a minimum value of 10Ω resistance with the above arrangement, find the resolution of the potentiometer in mm. 10

6 Write a short note on (Any two) :- 20

a Hall Effect Transducer

b Sound Pressure Level (SPL)meter

c Lead wire compensation in RTD

Sem-III (Choice Based)/INST/ Digital Electronic / NOV-17

QP CODE : 27284

(3 Hours) Marks : 80

NB : (1) Q. **No. 1** is **Compulory.** Attempt **any three** questions.
(2) **Figures** to the **right** indicate full **marks.**
(3) Assume suitable data if necessory

1. Answer the following **(Any Four)** 20
   (a) Convert : (i) $(FFFA)_{16} = (?)_8$
   (ii) $(101.1101)_2 = (?)_{10}$
   (b) Explain carry look ahead adder.
   (c) Compare combinational and sequential logic circuits.
   (d) Explain Race around condition and how it can be eliminated.
   (e) What are ROM and RAM. Compare these two memories.

2. (a) (i) Construct Hamming code for BCD 0110 use even parity 10
   (ii) Prove that : (i) $A\left[B + C\,\overline{(AB + AC)}\right] = AB$
   (ii) $\overline{AB.\overline{(C+D)}.AB} = \overline{A} + \overline{B} + C + D$

   (b) Implement the following Boolean equation using single 8:1 MUX and few logic gates. $F(A,B,C,D) = \Sigma M(0,1,3,4,8,9,15)$ 10

3. (a) Design Decade ripple counter and draw timing diagram. 10
   (b) Convert JK Flip-Flop to T Flip-Flop and D Flip-Flop. 10

4. (a) Minimize the following function using K-Map and implement using only universal gates. $F = \Sigma m(5,6,7,13,14,15)$ 10
   (b) What is shift register ? Explain the working of 4 bit universal shift register. 10

5. (a) Explain programmable Logic Devices. 10
   (b) What is a function Hazard ? How will you prevent Hazard. Explain. 10

6. Write a short note on : **(Any Four)** 20
   (a) Basic dynamic RAM cell
   (b) ECL family
   (c) Johnson Counter
   (d) EEPROM
   (e) Noise Margin, Fan-In, Fan Out, Propagation Delay time of IC's

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E/SEM/III/Choice Base/INST/Electical Network & Measurements/Nov-17

Q. P. Code: 27433

Duration: 03 Hours. Total marks assigned to the paper: 80

Marks assigned to each question are stated against each question.

Instructions to the candidates if any:-

N. B. (1) Question No. 1 is **compulsory**.

(2) Answer any **three** out of remaining **five** questions.

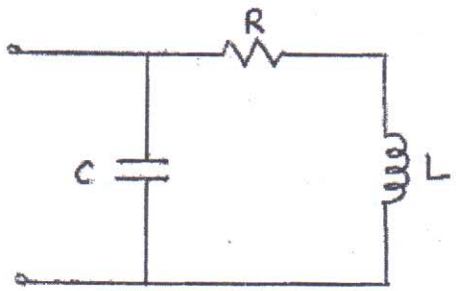
(3) Assumptions made should be **clearly stated**.

Q. No.		Marks

Q. 1 Attempt any **Four** 20

a) Explain steps involved in Maximum Power Transfer Theorem with the help of formulae and circuit diagram.

b) Determine the driving-point impedance function of a one-port network shown in following figure

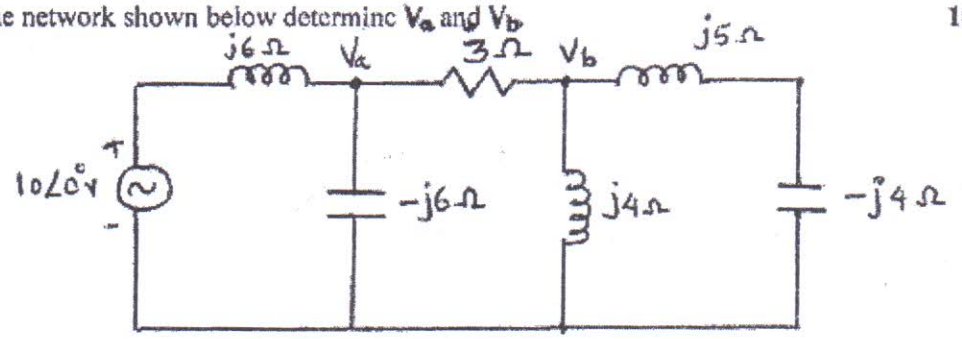


c) Test whether the polynomial $P(s) = s^4+7s^3+6s^2+21s+8$ is Hurwitz.

d) Write a short note on PMMC and PMMI Instruments

e) Why is Kelvin's double bridge used? Draw its circuit diagram and write the formula.

Q.2 a) In the network shown below determine V_a and V_b 10



b) In the network shown below the switch is changed from the position 1 to the position 2 at t = 0 steady condition having reached before switching. Find the values of i, di/dt and d^2i/dt^2 at $t = 0^+$ 10

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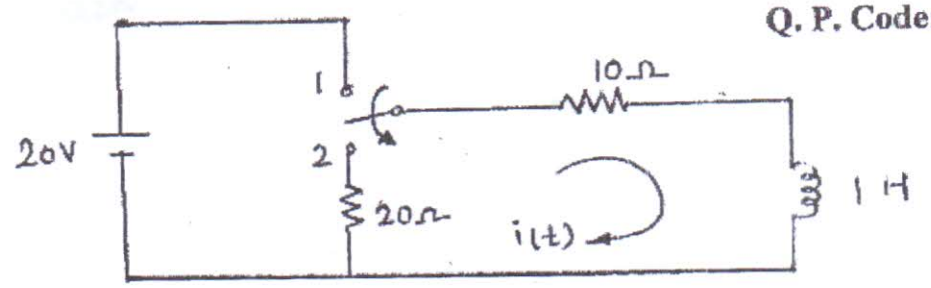
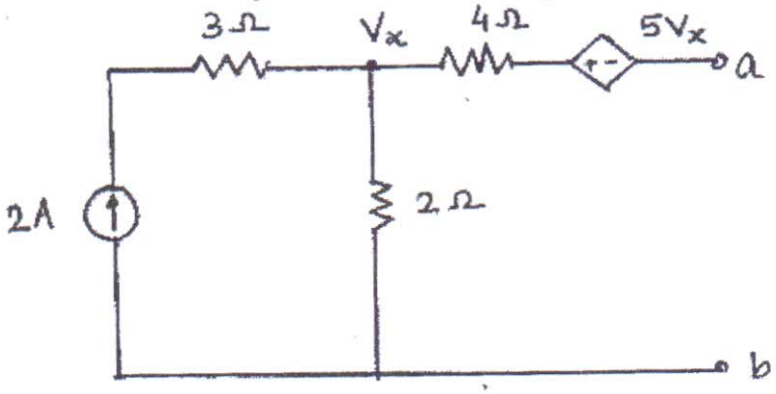
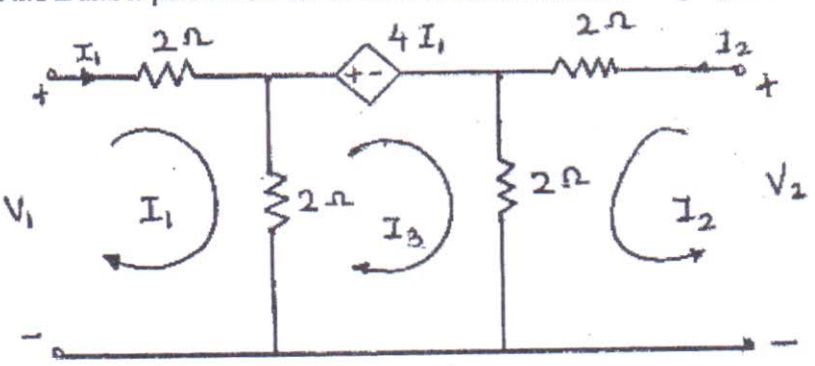


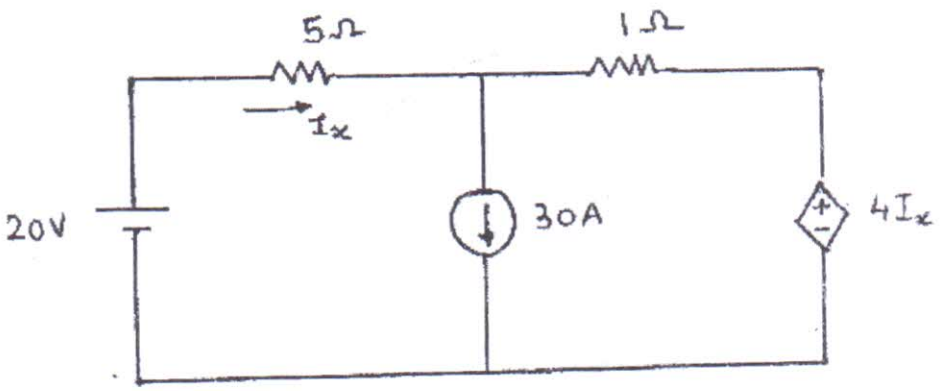
Q.3 a) Obtain the Thevenin equivalent network for the given network at terminals a and b. 10



b) Find Z and h-parameters for the network shown in following figure 10



Q. 4 a) Find the current I_x 10

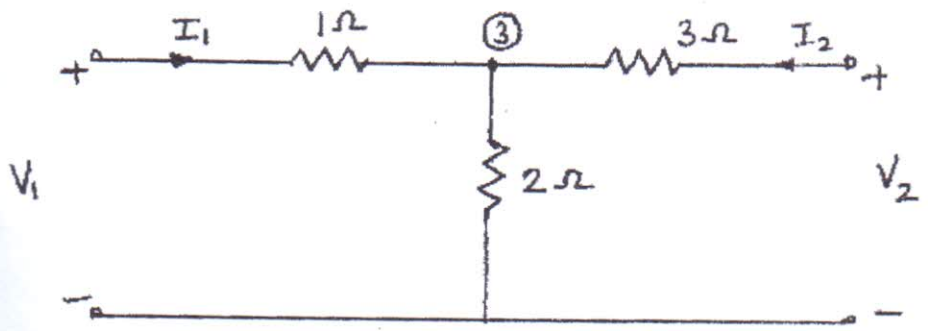


b) Determine the Foster form of realization of the RC impedance function 10

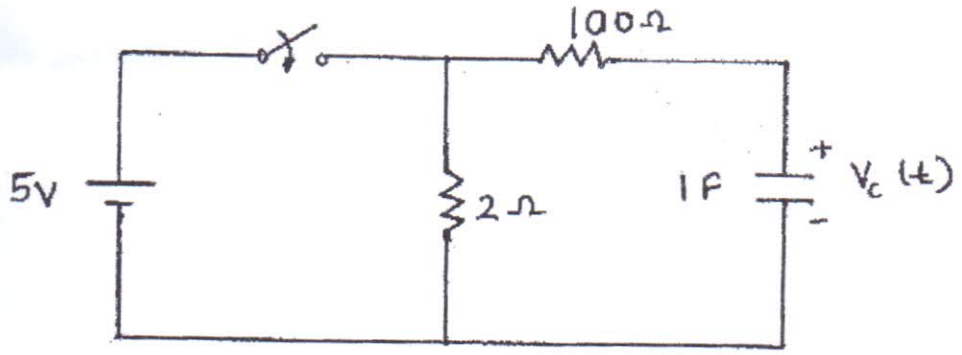
$Z(s)=(s+1)(s+3)/s(s+2)(s+4)$

Q.5 a) Explain Energy meter with the help of diagram in detail. 10

b) (i) Find Y-Parameters for the network shown in the following figure 05



(ii) In the figure shown below the switch is closed at t=0. Find $v_c(t)$ for $t > 0$ 05



Q.6 a) Mention high resistance measurement methods. Explain Megger in detail. 10

b) (i) Write a short note on CRO 05

(ii) Test whether $F(s) = (s^2+1)/(s^3+4s)$ is positive real function. 05

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