AIKTC/KRRC/SoET/ACKN/QUES/2017-18/ **Date:** _____

School: SoET-CBSGS **Branch:** EXTC ENGG. **SEM:** III

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- III	ETS301		✓	
2	Analog Electronics – I	ETC302		✓	
3	Digital Electonics	ETC303		✓	
4	Circuits & Transmission Lines	ETC304		✓	
5	Electronics Instruments & Measurement	ETC305		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

(60) SE-Com-III - CBSGS - AM-III - EXTC & FE 16/5/18

Q.P. Code : 13607

(3 Hours) **[Total marks : 80**

Note :-
1) Question number **1** is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the Laplace transform of $\cos t \cos 2t \cos 3t$. 05

b) Construct an analytic function whose real part is $e^x \cos y$. 05

c) Find the directional derivative of $\emptyset = x^4 + y^4 + z^4$ at point $A\,(1,-2,1)$ in the direction of AB where B is $(2,6,-1)$. 05

d) Expand $f(x) = lx - x^2,\ 0 < x < l$ in a half-range sine-series. 05

Q.2 a) Find the angle between the normals to the surface $xy = z^2$ at the points $(1,4,2), (-3,-3,3)$. 06

b) Find the Fourier series for 06

$$f(x) = \begin{cases} -c & -a < x < 0 \\ c, & 0 < x < a \end{cases}$$

c) Find the inverse Laplace transform of 08

(i) $\dfrac{4s+12}{s^2+8s+12}$

(ii) $\log\left(\dfrac{s^2+a^2}{\sqrt{s+b}}\right)$

Q. 3 a) State true or false with proper justification "There does not exists an analytic function whose real part is $x^3 - 3x^2y - y^3$. 06

b) Prove that $J_{5/2}(x) = \sqrt{\dfrac{2}{\pi x}}\left(\dfrac{3-x^2}{x^2}\sin x - \dfrac{3}{x}\cos x\right)$. 06

c) Expand $f(x) = 4 - x^2$ in the interval $(0, 2)$. 08

Q. 4 a) Use Gauss's Divergence theorem to evaluate $\iint_S \bar{N} \cdot \bar{F}\ dS$ where $\bar{F} = 4x\,i + 3y\,j - 2z\,k$ and S is the surface bounded by $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$. 06

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b) Prove that 06

$$\int x^3 \cdot J_0(x)\,dx = x^3 \cdot J_1(x) - 2x^2 \cdot J_2(x).$$

c) Solve using Laplace transform $\frac{dy}{dt} + 3y = 2 + e^{-t}$ with $y(0) = 1$. 08

Q. 5 a) Find Laplace transform of $(1 + 2t - 3t^2 + 4t^3)H(t-2)$ where 06

$$H(t-2) = \begin{cases} 0, & t < 2 \\ 1, & t \geq 2 \end{cases}$$

b) Prove that $2J_0''(x) = J_2(x) - J_0(x)$. 06

c) Obtain complex form of Fourier Series for $f(x) = e^{ax}$ in $(-\pi, \pi)$ where a is not an integer. Hence deduce that when α is a constant other than an integer 08

$$\sin \alpha x = \frac{\sin \pi\alpha}{i\pi} \sum \frac{(-1)^n n}{(\alpha^2 - n^2)} e^{inx}$$

Q. 6 a) Using Green's theorem evaluate 06

$$\oint_C (e^{x^2} - xy)\,dx - (y^2 - ax)\,dy$$

where C is the circle $x^2 + y^2 = a^2$.

b) Express the function 06

$$f(x) = \begin{cases} 1 & for\ |x| < 1 \\ 0 & for\ |x| > 1 \end{cases}$$

as a Fourier Integral.

c) Under the transformation $w = (1+i)z + (2-i)$, find the region in the w −plane into which the rectangular region bounded by $x = 0, y = 0, x = 1, y = 2$ in the z −plane is mapped. 08

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SE-Sem-III – CBSGS – EXTC-AE-I 8/5/18

Q. P. Code: 24887

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

NB:
(1) Question No.**1** is compulsory.
(2) Answer any **three** from remaining questions.
(3) **Figures** to the right indicate full marks.
(4) Assume suitable data if required.

Q.1 **Attempt any four**

a Give the equation for the current in semiconductor diode. With the help of this equation explain in detail the V-I characteristics of a semiconductor diode. 5

b Explain effect of temperature on JFET and derive equation for zero temperature drift. 5

c For the circuit shown in fig 1 determine small signal hybrid pi parameters of transistor. 5

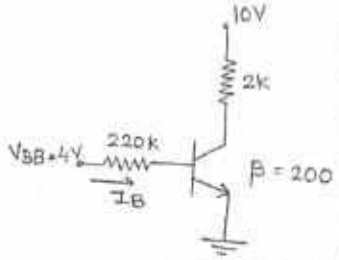

Fig.1

d Design clipper circuit for the output shown in figure.2 Assume diode is ideal.

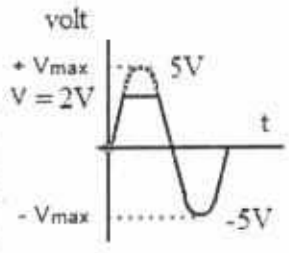

Fig.2

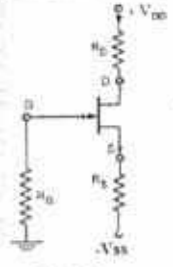

Fig.3

e For the FET shown in figure.3 the drain current equation is $I_{DQ} = 9\left(1 + \frac{V_{GSQ}}{3}\right)^2$ mA. Determine I_{DQ}, V_{GSQ}, V_{DSQ}, V_D. V_{DD}=18V, R_D=2.2kΩ, R_S=1.2KΩ, $-V_{SS}$=-9V and R_G=1MΩ. 5

Q.2

a For the circuit shown in Fig.4 determine the V_{ECQ}, I_{CQ}, V_C, and V_E. 10

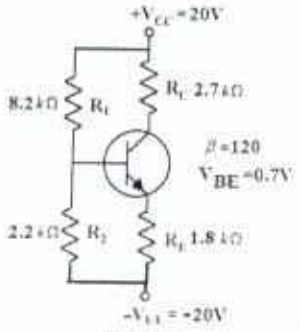

Fig.4

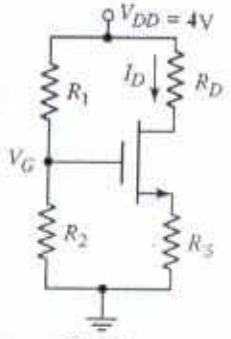

Fig.5

b Design the circuit shown in Fig.5 such that V_{GS}=0.50V and V_{DS}=2.5V. The transistor parameters are: V_{TN}=0.24V, Kn=1.1mA/V2, and λ=0. Let R_1+R_2=50KΩ. 10

Q.3

a Analyze and derive the expression for the voltage gain, input impedance and output impedance for common collector amplifier with voltage divider biasing. 10

b For the amplifier shown in Fig.6 analyze and determine. 10

i. Small-signal voltage gain.

ii. Input and output impedance.

BJT and circuit parameters are: $\beta = 100, V_{BE} = 0.7V$. $R_1 = 56k\Omega$, $R_2 = 12.2k\Omega$, $R_E = 0.4k\Omega$, $R_C = 2k\Omega, R_L = 10k\Omega R_S = 0.5k\Omega, V_{CC} = 10V$

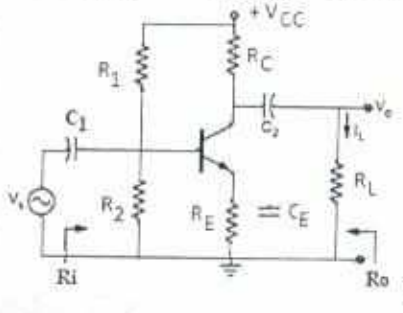

Fig.6

Q.4

a Draw the structure of an N-channel Enhancement type MOSFET. Explain its working with the help of output drain characteristics and transfer characteristics. 10

b For the MOSFET common source amplifier shown in fig.7 determine output voltage, input impedance and output impedance. Given: $V_{TN} = 1V$, $K_N = 0.5\ mA/V^2$, $\lambda=0.01V^{-1}$. 10

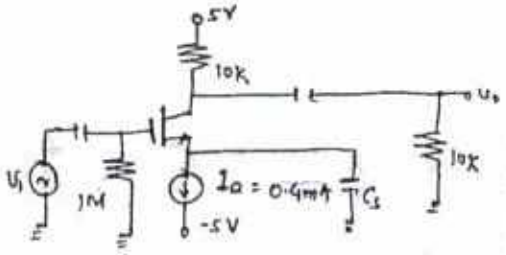

Fig.7

Q.5

a Draw and explain energy band diagram of MOS capacitor in accumulation, depletion and inversion region. 10

b Derive the expression for frequency of oscillation for a transistorized (BJT) RC phase shift oscillator. 10

Q.6 Write a short note on following.

a Cristal oscillator and its application. 5

b Schottkey Diode (Construction and operation and application) 5

c Graphical analysis of BJT amplifier to determine parameters. 5

d h-Parameter equivalent circuit for BJT 5

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(2) SE-sem-III - CBSGS - EXTC - DE 22/5/18

Q. P. Code: 35474

(3 Hours) **Total Marks: 80**

N.B. (1) Question No. 1 is **Compulsory**
(2) Out of remaining questions, attempt **any three**
(3) **Assume** suitable data if required
(4) Figures to the right indicate **full marks**

Q.1	**(a)**	State and prove De Morgan's Theorems	[5]
	(b)	Compare Combinational and sequential logic Circuits	[5]
	(c)	Define Propagation delay, Power Dissipation, Fan Out, Fan in for TTL family	[5]
	(d)	Explain Programmable Logic Array	[5]
Q.2	**(a)**	Prove that NAND and NOR Gates are universal Gates	[10]
	(b)	Design a two-bit digital comparator and implement using Gates	[10]
Q.3	**(a)**	Simplify the logical expressions using Boolean Laws and implement using Gates $Y_1 = (A + C)(A + D)(B + C)(B + D)$, $Y_2 = (AB + C)(AB + D)$	[10]
	(b)	Implement the given function using 8:1 Multiplexer $F(A, B, C, D) = \sum m(0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 15)$	[10]
Q.4	**(a)**	Explain the working of universal shift register	[10]
	(b)	Write a VHDL program to design a 4:1 Mux	[10]
Q.5	**(a)**	Minimize the following expression using Quine McClusky Technique $F(A,B,C,D) = \sum m(1, 3, 7, 9, 10, 11, 13, 15)$	[10]
	(b)	Convert JK FF to D FF and T FF to D FF	[10]
Q.6	**(a)**	Design a 3-bit asynchronous counter using JK FF. Draw neat timing diagram	[10]
	(b)	Write a note on CPLDs	[10]

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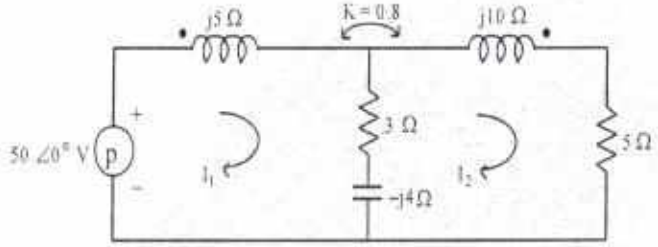
(25) SE-sem-II - CBSGS - EXTC - CTL 1/6/18

Q. P. Code: 24590

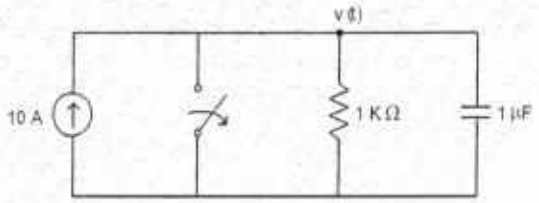
Time: 3 hours Total Marks: 80

N.B.
1) Question No. 1 is Compulsory
2) Out of remaining questions, attempt any three
3) Assume suitable data if required
4) Figures to the right indicate full marks

1 (A) Draw equivalent circuit for given magnetically coupled circuit. 05



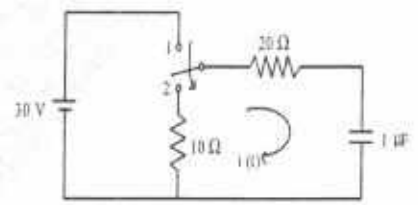
(B) In the given network of Fig., switch is opened at t = 0. Solve for v and $\frac{dv}{dt}$ at t = 0+. 05



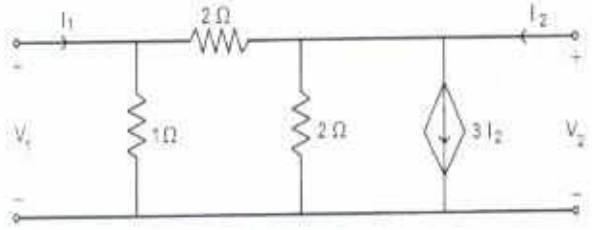
(C) Prove that AD – BC = 1 for Transmission parameters. 05

(D) Define the folowing parameter of transmission lines: 05
i) Input impedance
ii) Charateritics Impedance
iii) VSWR
iv) Reflection Coefficient
v) Transmission Coefficient

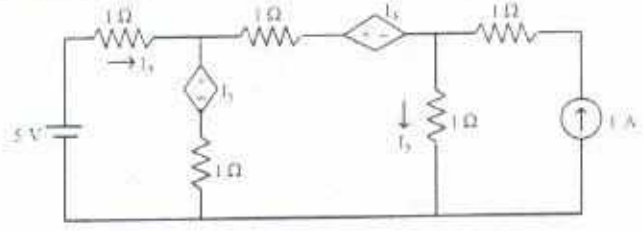
2 (A) In the network shown in Fig., switch is changed from position 1 to position 2 at t = 0, steady condition having reached before switching. Find the values of i, $\frac{di}{dt}$ and $\frac{d2i}{dt2}$ at t = 0+. 10



(B) For the network shown in Fig., find Z and Y-parameters. 10



3 (A) Find currents in the three meshes of network shown in Fig. 10



(B) The parameters of a transmission lines are R = 65Ω/km, L=1.6mH/km, G = 2.25 mmho/km, C=0.1μF/km. Find 10

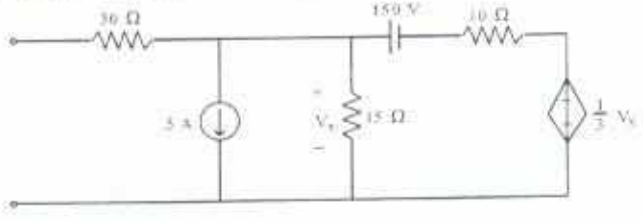
i) Characteristic Impedance
ii) Propagation Constant
iii) Attenuation Constant
iv) Phase Constant at 1 kHz

4 (A) Determine whether following functions are positive real 10

i) $\dfrac{s^4 + 3s^3 + s^2 + s + 2}{s^3 + s^2 + s + 1}$

ii) $\dfrac{s(s+3)(s+5)}{(s+1)(s+4)}$

(B) Obtain Thevenin equivalent network of Fig. 10



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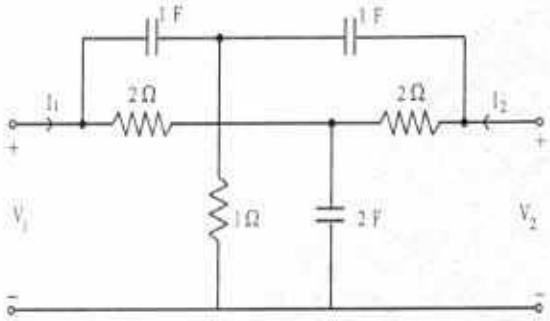
5 (A) Find Y-parameters for the network shown in Fig. 10

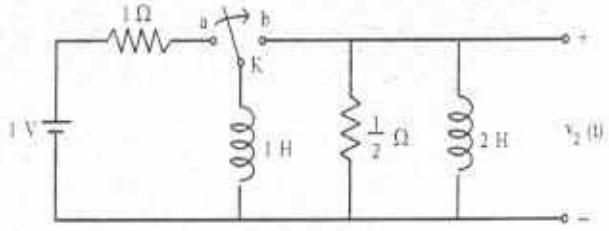


(B) Realize the following functions in Foster II and Cauer I form 10

$$Z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+4)}$$

6 (A) A transmission line has a characteristics impedance of 50 ohm and terminate in a load $Z_L = 25 + j50$ ohm. Use smith chart and Find VSWR and Reflection coefficient at the load. 10

(B) In the network of Fig. switch is in position 'a' for a long time. At t = 0 switch is moved from a to b. Find $v_2(t)$. Assume that the initial current in 2 H inductor is zero. 10



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SE - sem-III - CBSGS - EXTC - EIM

2/6/18

Q.P.Code: 21759

(3 Hours) **[Total Marks: 80]**

Instructions – i) Questions 1 is Compulsory
ii) Out of remaining questions attempt any three questions
Iii) Assume suitable additional data if required.bridge
iv)Figures in the bracket to the right hand side indicate full marks.

Q.1	a)	Compare analog instrument with digital instrument.	**(05)**
	b)	Explain selection criteria for transducers.	**(05)**
	c)	Which is fastest ADC and why?	**(05)**
	d)	Describe the various types of sweeps used in CRO.	**(05)**
Q.2	a)	Explain working of LVDT and define its application in displacement measurement.	**(10)**
Q.2	b)	Draw neat block diagram of Dual Beam oscilloscope. Give the comparison between Dual Trace and Dual Beam Oscilloscope.	**(10)**
Q.3	a)	Draw and explain Hay bridge and its application for measurement of inductances.	**(10)**
Q.3	b)	Explain principle of operation and working of dual slope DVM.	**(10)**
Q.4	a)	Define power and energy and explain working of a single phase energy meter.	**(10)**
Q.4	b)	Draw and explain capacitive transducer for level measurement	**(10)**
Q.5	a)	Draw the block diagram of generalised measurement system and explain its component	**(10)**
Q.5	b)	Draw andexplain Wheatstone bridge and drive expression for measurement of resistance.	**(10)**
Q.6	a)	Explain dual slope ADC with neat block diagram and comment on its speed	**(10)**
Q.6	b)	Define Q factor and explain working of a Q meter for Q factor measurement.	**(10)**