**14EC/EI 501**

**Hall Ticket Number:**

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**III/IV B.Tech(Regular/Supply) DEGREE EXAMINATION**

**November, 2016** **Common for ECE & EIE**

**Fifth Semester** **Linear Integrated Circuits**

**Time:** Three Hours **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12=48 Marks)

**1.** Answer the following (12X1=12Marks)

a Define virtual ground property of an op-amp?
b Define CMRR of an op-amp?
c What is active load? Where it is used and why?
d Define Pull-in time.
e What is a comparator?
f On what parameter does the free running frequency of VCO depends on?
g Define conversion time.
h List out some integrating type converters.
i Define resolution of a Data converter?
j What is the purpose of control voltage pin (5) of 555 timer .
k What are the three stages through which PLL operates?
l What are the advantages of active filters over passive filters?

**UNIT – I**

2.a Explain the dominant pole compensation technique applied to frequency response of op-amp. 6M

2.b A square wave of peak-peak amplitude of 500mv has to be amplified to an output with peak-peak amplitude of 3V with a rise time of 4μs.What should be minimum slew rate of the op-amp required to implement the circuit? Can you use an op-amp 741 with slew rate=0.5μV/sec? 6M

**(OR)**

3.a Explain a non saturating type precision half wave rectifier, with a neat circuit diagram? 6M

3.b Discuss briefly about Differentiator circuit using an op-amp and also derive an expression for $V_0$. 6M

**UNIT – II**

4.a State Barkhausen criteria and explain how it is fulfilled in the RC phase shift oscillator. 6M

4.b Also derive an expression for $A_{vf}$, $f_0$. 6M

**(OR)**

5.a With the help of neat circuit diagram, Explain about inverting Schmitt trigger using an op-amp and its I/O characteristics. 6M

5.b Write a short note on Zero crossing detector? 6M

**UNIT – III**

6.a What are the limitations of weighted resistor type D/A converter? 8M

6.b With neat block diagram, explain about successive approximation type A/D converter. 4M

**(OR)**

7.a What do you mean by quantization error in an A/D converter? 8M

7.b Draw the circuit of a negative peak clamper and explain its operation with necessary waveforms. 4M

**UNIT – IV**

8.a Design a second order LP Butterworth filter, having a cutoff frequency of 1kHz 6M

8.b Explain frequency translation and FSK demodulation using 565 PLL. 6M

**(OR)**

9.a With the help of neat diagram and waveforms, explain about monostable multivibrator using a timer. Also derive an expression for pulse width. 6M

9.b Design a voltage regulator using IC 723 to get a voltage output of 5V. 6M

**14ECEI 502**

**Hall Ticket Number:**

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**III/IV B.Tech (Regular) DEGREE EXAMINATION**

**November, 2016** **Common for ECE & EIE**

**Fifth Semester** **Linear Control Systems**

**Time:** Three Hours **Maximum:** 60 Marks

*Answer Question No.1 Compulsorily.* (1×12=12 Marks)

*Answer ONE question from each unit* (4×12=48 Marks)

1. Answer all questions (1×12=12 Marks)

a. What is the effect of negative feedback on stability

b. What are the properties of signal flow graph

c. What is impulse response of a system and its significance?

d. The characteristic equation of a system is $S^2+4S+10=0$ determine the nature of the response of the system and also draw its response

e. Define type number of a system and what is the relation between type & steady state error of a system

f. Define relative stability of a system

g. Determine $M_r$ and $W_r$ for the characteristic equation $S^2+8S+16=0$

h. What is minimum phase system

i. What is the effect of adding a pole to G(s)H(s) on root locus? justify your answer

j. How will you find gain K at a point on root locus

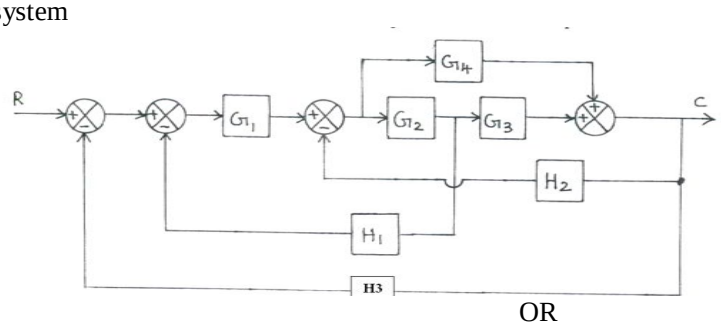
k. Define state of a system

l. What properties of State Transition Matrix.

**UNIT-I**

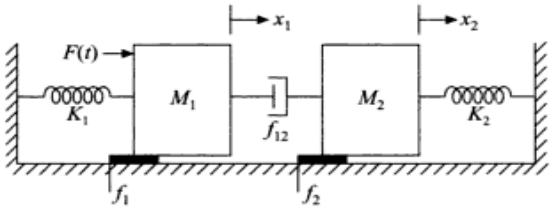
2. (a) What is feedback? Explain the effects of feedback on control system parameters (gain, stability, sensitivity and disturbances). (6M)

(b) Using block diagram reduction technique find the closed loop transfer function of the system (6M)

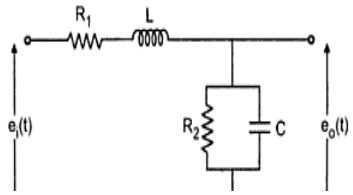



OR

3. (a) Develop electrical analogous system for the given system and also obtain the analogous mathematical equations (6M)




(b) Determine Transfer function $E_o(S)/E_i(S)$ of an electrical system (6M)



**UNIT-II**

4. a) A system has G(s) =K/s(1+sT) with unity negative feedback where K and T are constants. Determine the factor by which K must be multiplied to reduce the peak overshoot from 85% to 35%. (6M)

b) For a unity negative feedback system whose G(s) =10/s(s+1)(s+2).Find the static error constants. Find the steady state error when applied input signal is $r(t)=2+3t+5t^2$ and identify type of the system. (6M)

**OR**

5. (a) A unity feedback system is characterized by the open loop transfer function $G(s)=\frac{k(s+13)}{s(s+3)(s+7)}$. Apply Routh criterion

i) Calculate the range of values of k for the system to be stable

ii) What is limiting value of k for stability and also determine the frequency of (6M) Oscillations.

(b) Derive the expression for the time response of a second order under damped system(6M)

**UNIT III**

6. (a)The open loop transfer function of a unity feedback system is given as $G(s)=\frac{ke^{-0.2s}}{s(s+2)(s+8)}$ Using Bode plot analysis determine gain margin, phase margin, gain crossover frequency and phase crossover frequency. (8M)

(b) Define frequency domain specifications and derive the same for a second order system(4M)

OR

7. (a) Sketch the polar plot for the open loop transfer function $G(S)=\frac{K}{S(1+0.2S)(1+0.05S)}$

Determine value of k for the gain margin of 18dB (6M)

(b)Explain the procedure for the construction of a Nyquist plot (6M)

UNIT IV

8. (a) Sketch root locus on graph sheet for the system whose open loop transfer function is $G(s)H(s)=K/S(S+4)(S^2+4S+20)$. (8M)

i)Comment on the stability of the system.

ii) Determine the range of values of K for the system to be under damped, over damped and critically damped

(b) A system is described by $\dot{X}=\begin{bmatrix}1 & -1\\ 1 & 1\end{bmatrix}X+\begin{bmatrix}0\\ 1\end{bmatrix}U, Y=\begin{bmatrix}1 & 0\end{bmatrix}X$ Check the controllability and observability. (4M)

OR

9. (a) For the given system $\dot{X}=AX+BU, Y=CX+DU$ where

$$A=\begin{bmatrix}1 & 2 & 1\\ 0 & 1 & 3\\ 1 & 1 & 1\end{bmatrix}, B=\begin{bmatrix}1\\ 0\\ 1\end{bmatrix}, C=\begin{bmatrix}1 & 1 & 1\end{bmatrix}, D=0.$$ (6M)

Find the transfer function and roots of the characteristic equation.

(b) Obtain the state space model of the following transfer function (6M)

$$\frac{Y(S)}{U(S)}=\frac{1}{S^4+10S^3+6S^2+10S+5}$$

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**III/IV B.Tech (Regular) DEGREE EXAMINATION**

**November, 2016** **Common for ECE & EIE**

**Fifth Semester** **Electronic Circuits - II**

**Time:** Three Hours **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12 =48 Marks)

Answer all Questions (12X1=12 Marks)

**1** a) Why the parasitic capacitances considered at high frequencies?
b) Write the condition for validity of hybrid-pi model.
c) What is the effect of $|V_{CE}|$ on $g_m$ for BJT at high frequency?
d) What is the importance of load regulation?
e) Define trans-conductance of FET.
f) Calculate the amplification factor, μ of FET, if $r_d$ = 4KΩ and gm = 4mA/V.
g) What is meant by phase shift distortion?
h) What is the importance of bypass capacitor in CE amplifier?
i) Why cascading of amplifiers is needed?
j) What are the advantages of double tuned amplifier over single tuned amplifier?
k) What is the effect of cascading single tuned amplifiers on bandwidth?
l) Define unloaded and loaded Q of tuned circuit.

**UNIT – I**

**2** a) Draw the high frequency BJT small signal model and derive its conductance parameters in terms of low frequency parameters. **(6M)**
b) At $I_C$=1mA and $V_{CE}$=10V, a certain transistor data shows $C_{b'c}$=3PF, hfe=200 and $\omega_T$=500 M rad/sec. Calculate $g_m$ and $\omega_\beta$. **(6M)**

**(OR)**

**3** a) Derive the expression for CE short circuit current gain as a function of frequency **(6M)**
b) The following low-frequency parameters are available for a transistor at $I_{CQ}$ = 5 mA $h_{ie}$ = 1K, $h_{fe}$ = 100 $h_{oe}$ = 4 x 10-5 A/V $h_{re}$ = $10^{-4}$ $C_{ob}$ = 2 pF fT = 10 MHz Compute the values of hybrid-π parameters at room temperature. **(6M)**

**UNIT – II**

**4** a) Analyse JFET common source amplifier at high frequencies to find voltage gain and input admittance **(6M)**
b) A CS amplifier has a drain circuit resistance $R_d$ of 100K and operates at 20KHz. Calculate the voltage gain for given FET parameters of $g_m$=1.6mA/V, $r_d$=44K, $C_{gs}$=3pF,$C_{ds}$=1pF and $C_{gd}$=2.8pF. **(6M)**

**(OR)**

**5** a) Draw the circuit and explain how short circuit over load protection is provided in Voltage regulators circuits. **(6M)**
b) Draw the circuit of series voltage regulator and list the steps in the design procedure. **(6M)**

**UNIT – III**

**6** a) Draw the neat-labeled diagram of two-stage RC coupled amplifier and explain importance of each component. **(6M)**
b) Design a two stage RC coupled cascade amplifier for the gain of 100, assume necessary data. **(6M)**

**(OR)**

**7** a) Derive the expression for high 3-dB frequency $f_H$* of n identical non-interacting stages in terms of $f_H$ for one stage. **(6M)**

b) A multistage audio amplifier is to be constructed using 4 identical stages. What should be the lower and upper cutoff frequencies of each stage if the overall lower and upper cutoff frequencies are to be 20Hz and 20KHz respectively? **(6M)**

**UNIT – IV**

**8** a) Draw and explain the single tuned capacitive coupled amplifier. **(6M)**

b) A single tuned transistor amplifier is used to amplify modulated RF carrier of 600 KHz and bandwidth of 15 KHz. The circuit has a total output resistance, Rt = 20KΩ and output capacitance $C_0$=50pF. Calculate values of inductance and capacitance of tuned circuit. **(6M)**

**(OR)**

**9** a) Derive the expression for bandwidth of a parallel resonance circuit. **(6M)**

b) A parallel RLC circuit is resonant at 2.7 KHz. The circuit has inductance L = 0.015H, capacitance C = 0.232 μF and a parallel resistance of 30KΩ.

(i)What is the circuit impedance at resonance?

(ii)What is the circuit Q?

(iii)What is the bandwidth?

(iv)What is the circuit impedance at $f_2$, the upper band limit? **(6M)**

**14EC504**

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**III/IV B.Tech (Regular) DEGREE EXAMINATION**

**November, 2016** — **Electronics and Communication Engineering**

**Fifth Semester** — **EM Waves And Transmission Lines**

**Time:** Three Hours — **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12=48 Marks)

**1.** Answer all questions (1X12=12 Marks)

a Define the angle of incidence.
b Define Snell's law for reflection.
c Define criticalangle.
d What is an infinite length transmission line and write its significance.
e A transmission line with characteristic impedance of 100Ω and load resistance of 50Ω, calculate the reflection coefficient of the line.
f What is a lossless transmission line and write an expression for its characteristic impedance.
g What are the drawbacks of single stub impedance matching
h Define the input impedance of a transmission line.
i Why short circuited stubs are preferred over open circuited stubs?
j A rectangular waveguide with the dimensions, a=0.015m and b=0.01m. Find the cutoff frequency for $TE_{10}$ mode?
k The propagation of TEM waves does not exist in hallow waveguides. Why?
l Define a transeverse magnetic wave.

**UNIT – I**

2.a Explain the reflection and transmission at a general dielectric interface at normal incidence 8M

2.b A very large sheet of steel is illuminated by aplane wave at 2.45 GHz. The steel is 1mm thick and area of wall is 1 $mm^2$, has a conductivity of $10^7$ s/m and relative permeability of 200. The time averaged power density impinging on the sheet is 1000 $W/m^2$ and the wave impinges on the walls perpendicularly. Calculate the power dissipated in the steel per unit area. 4M

**(OR)**

3.a Explain the reflection and transmission for layered materials at normal incidence 6M

3.b A plane wave propagates from free space into copper calculate the time averaged power density entering the copper and show that the amount of power per unit area of the interface going into copper is very small. Assume frequency is 100MHz and the magnitude of the incident electric field intensity at the surface in air is 100 V/m. The conductivity of copper is $5.7x10^7$ S/m. 6M

**UNIT – II**

4.a Derive the expressions for characteristic impedance and propagation constant of a transmission lineline 6M

4.b A power line is mode of two round parallel conductors of 20mm in diameter, separated by3m and suspended in air. Neglect the ground effects. Properties of air are: $\in_0 \ \mu_0, \sigma = 10^{-5} s/m$. The line is made of copper $(\mu = \mu_0, \in = \in_0, \sigma_c = 5.7x10^7 s/m)$ and operates at 60Hz. Calculate: (i) propagation constant (ii) characteristic impedance 6M

**(OR)**

5.a Derive the condition for a distortion less transmission line and write its significance. 6M

5.b A line is made of two copper conductors, Diameter of each copper conductor is 1mm and $\sigma_{copper}=5.7\times10^7$ s/m is placed in a low loss dielectric($\sigma = 10^{-4}$s/m, $\mu = \mu_0, \in = 4 \in_0$). Assume the frequency used is 100 MHZ, and dielectric extends far from the conductors. 6M

a) Calculate the required distance between the two wires to produce a distortionless line at the given frequency.
b) Find the characteristic impedance of the line and its attenuation constant.

## UNIT – III

6.a Explain the construction of a smith characteristics and discuss its usefulness in line calculations. 8M

6.b A transmission line with characteristic impedance $Z_0=50\Omega$, operates at 1GHz. The speed of propagation on the line is $3x10^8$m/sec and load impedance is $75+j100\Omega$. Using smith chart, find : 4M

(i) The reflection coefficient at the load.

(ii) Input impedance at 20m from the load.

**(OR)**

7.a Distinguish between short and long pulses. What is the important measure in this distinction. 6M

7.b Explain the capacitive loading and lnductance loading techniques. 6M

## UNIT – IV

8.a Derive the expressions for field components for TE waves in a rectangular waveguide 8M

8.b A rectangular waveguide has internal dimensions a=19.05mm,b=9.53mm.The waveguide is air filled and propagates waves at 18GHz (i) Calculate the lowest possible TM mode at which the wave may be excited. (ii) Calculate guide length and guide phase velocity 4M

**(OR)**

9.a Explain TM wave propagation in parallel plate wave guides and derive the expressions for its filed components 8M

9.b A parallel plate waveguide is made of two strips, a=20mm and separated by d=1mm and air filled. Neglect edge effects. For an incident electric field intensity of magnitude $E_i=1V$, calculate at a frequency 20% above the lowest cutoff frequency. (i) Guide phase velocity, guide wave length and wave impedance for TM modes. (ii) the instantaneous power density in the waveguide. 4M

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**III/IV B.Tech (Supplementary) DEGREE EXAMINATION**

**November, 2016** **Common for ECE, EEE & EIE**

**Fifth Semester** **Linear ICs & Applications**

**Time:** Three Hours **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12=48 Marks)

**1.** Answer all questions (1X12=12 Marks)

a Define CMRR.
b Define input offset current.
c What are the characteristics of ideal op-amp?
d What are the disadvantages of negative feedback?
e Mention the sources of error in op-amp.
f What are the limitations of op-amp as comparator?
g What is a quadrature oscillator?
h Define settling time of a ADC.
i What is the use of control pin in IC555?
j What factors decide the speed of conversion of ADC?
k Mention an application for an all-pass filter.
l Mention applications of active filters over passive filters.

**UNIT – I**

2.a Draw the practical circuit of an OP-AMP differentiator and explain its operation with frequency response. 6M

2.b Explain how OP-AMP can be used as precision full-wave rectifier. 6M

**(OR)**

3.a Explain the applications of OP-AMP as voltage to current and current to voltage converter. 6M

3.b Explain the operation of instrumentation amplifier using OP-AMP. 6M

**UNIT – II**

4.a Explain the generation of square wave using two op-amps and derive the expression for output voltage. 6M

4.b Explain the operation of a window detector using op-amp, how is it differentfrom a zero crossing detector. 6M

**(OR)**

5.a Explain about op-amp as a comparator and also explain about its different characteristics. 6M

5.b Explain the principle of operation of a RC-phase shift oscillator & derive for the maximum gain required and frequency of oscillations. 6M

**UNIT – III**

6.a Explain the operation of ramp type A-to-D converter with necessary diagram. 6M

6.b Draw the circuit of 4-bit binary weighted D/A converter. Explain the operation and derive the expression for the output. 6M

**(OR)**

7.a What is sampling? Explain the operation of sample and hold circuit. 6M

7.b Explain about absolute value output circuit. 6M

**UNIT – IV**

8.a Explain the operation of IC555 timer as astablemultivibrator.Derive its frequency of oscillations. 6M

8.b A low pass Butterworth filter is to be designed to have a 3dB band width of 200Hz and an attenuation of 50dB at 400Hz. Find the order of the filter. 6M

**(OR)**

9.a With pin configuration diagram explain the operation of PLL.Explain lock and capture range. 6M

9.b Give the classification of filters and explain the frequency response of all filters.What is state variable filter? 6M

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**III/IV B.Tech (Supply) DEGREE EXAMINATION**

**November, 2016** **Common for ECE & EIE**

**Fifth Semester** **Linear Control Systems**

**Time:** Three Hours **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12=48 Marks)

1 Answer the following (12X1=12Marks)

a) Define feedback and classification of feedback.
b) Define transfer function.
c) Define linear and non linear systems with example.
d) What is meant by parabolic function? How do you represent graphically.
e) Define the time constant of the system.
f) What is pole and zero of a transfer function?
g) Define gain margin.
h) What the advantages of nyquist plot over bode plot?
i) Define state, state variables.
j) What is meant by magnitude plot?
k) Write state space equations for linear time invariant system.
l) Define root locus.

**UNIT-I**

2 a) Define system and diffrentiate between closed and open loop systems with pratical example. (6M)

b) Write the differential equations governing the mechanical system shown below fig. 1.1 and determine the transfer function $Y_1(s)/F(s)$.

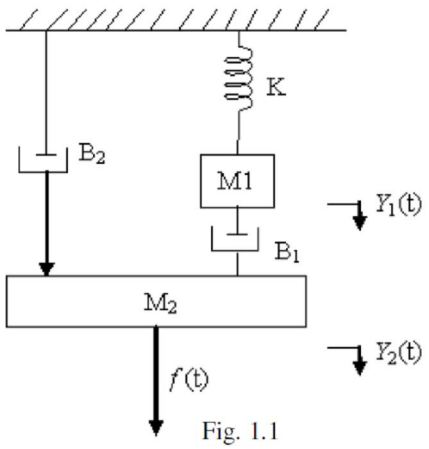
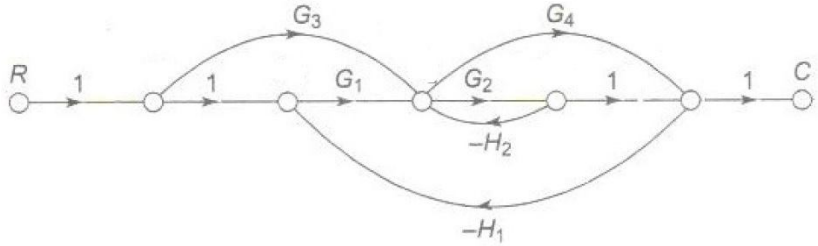



Fig. 1.1 (6M)

**(OR)**

3 a) Determine C(s)/R(s) by using mason's gain formula.




(6M)

b) Explain operation of synchro transmitter – receiver pair with a neat sketch. (6M)

**UNIT-II**

4 a) By means of Routh criterion, determine the stability of the system represented by thecharacteristic equation $s^4 + s^3 + 2s^2 + 2s + 5 = 0$. (6M)

b) Determine transient time specifications for a given closed loop transfer function

$$\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$$ (6M)

**(OR)**

5 a) Find the step, ramp and parabolic error coefficients and their corresponding steady state errors for unity feedback control system having the transfer function.

$$\frac{C(s)}{R(s)} = \frac{K(S+3)}{s(s+5)(s^2+2s+5)}$$ (6M)

b) Derive the expressions for peak time and settling time of standard 2nd order system when subjected to a unit step input. (6M)

**UNIT-III**

6 Sketch the bode plot for the following open loop transfer function

$$G(s)= \frac{100}{s(s+2)(s+1)}$$ (12M)

**(OR)**

7 a) State and explain Nyquist stability criterion (6M)

b) For the following system sketch the polar plot

$$G(s)H(s)= \frac{500}{s(s+6)(s+9)}$$ (6M)

**UNIT-IV**

8 a) Explain the following i) state equation, ii) output equation and iii) state model (6M)

b) Sketch the root locus for a system with open loop transfer function

$$G(s)= \frac{K(s+1)}{s(s+3)(s+4)}$$ (6M)

**(OR)**

9 a) Derive the properties of state transition matrix (6M)

b) A system is described by $\dot{x} = \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = [1 \quad 0]x$

check the controllability and observability of the system (6M)

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**III/IV B.Tech (Supplementary) DEGREE EXAMINATION**

**November, 2016** **Common for ECE, EEE & EIE**

**Fifth Semester** **Electronic Circuits - II**

**Time:** Three Hours **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12 =48 Marks)

1. Answer all Questions (12X1=12 Marks)

a) What is the effect of $|V_{CE}|$ on $g_m$ for BJT at high frequency?
b) Draw simple zenar voltage Regulator.
c) What is $f_T$ of the transistor?
d) Define line regulation.
e) Calculate the amplification factor, μ of FET, if $r_d$ = 4KΩ and gm = 10mA/V.
f) Draw the small signal model of JFET at high frequency.
g) What is meant by frequency distortion?
h) What is the use of emitter bypass capacitor in two stage RC coupled amplifier?
i) Define the frequency response magnitude characteristic of an amplifier?
j) Explain the effect of resistance on quality factor for a tuned circuits?
k) What is the effect of cascading single tuned amplifiers on bandwidth?
l) What is dissipation factor?

**UNIT-I**

2. a. Draw the high frequency BJT small signal model and derive its conductance parameters in terms of low frequency parameters. 6M
b. At $I_C$=1mA and $V_{CE}$=10V, a certain transistor data shows $C_{b'c}$=3PF, hfe=200 and $\omega_T$=500 M rad/sec. Calculate $g_m$. 6M

**(OR)**

3. a. Derive the expression for CE short circuit current gain as a function of frequency 6M
b. Following measurements of a certain transistor are available at room temperature with $I_c$ = 5 mA, $V_{CE}$=10V, $h_{fe}$ = 100, $h_{ie}$ = 600Ω. Aie = 10 at 10MHz. Cc = 3pF. Calculate $f_\beta$ and $f_T$. 6M

**UNIT-II**

4. a. Derive the voltage gain of a Common Drain amplifier at high frequencies 6M
b. A CD amplifier has a source circuit resistance $R_s$ of 1K and operates at 20KHz. Calculate the voltage gain for the given FET parameters of $g_m$=1.6mA/V, $r_d$=44K, $C_{gs}$=3pF,$C_{ds}$=1pF and $C_{gd}$=2.8pF. 6M

**(OR)**

5. a. Draw the circuit and explain how short circuit over load protection is provided in Voltage Regulators circuits. 6M
b. Draw the block diagram of switching mode power supply and explain its operation 6M

**UNIT-III**

6. a. Derive the expression for lower cutoff frequency for two stage RC coupled CE amplifier 6M
b. Derive the expression for high 3-dB frequency $f_H$* of n identical non-interacting stages in terms of $f_H$ for one stage. 6M

**( OR )**

7. a. Explain the effect of emitter bypass capacitor on the frequency response of a CE amplifier. 6M
b. Draw the circuit of RC coupled CE amplifier and explain. 6M

**UNIT-IV**

8. a. Derive the expression for bandwidth of n number of identical single tuned amplifiers. 6M

b. A single tuned transistor amplifier is used to amplify modulated RF carrier of 600 KHz and bandwidth of 15 KHz. The circuit has a total output resistance, Rt = 20KΩ and output capacitance C0=50pF. Calculate values of inductance and capacitance of tuned circuit. 6M

**( OR )**

9. a. Find the optimum bandwidth of the tuned secondary FET amplifier. 6M

b. Derive the expression for bandwidth of parallel resonant circuit . 6M

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**III/IV B.Tech (Supplementary) DEGREE EXAMINATION**

**November, 2016** — **Electronics and Communication Engineering**

**Fifth Semester** — **Analog Communication**

**Time:** Three Hours — **Maximum :** 60 Marks

*Answer Question No.1 compulsorily.* (1X12 = 12 Marks)

*Answer ONE question from each unit.* (4X12=48 Marks)

**1.** Answer all questions (1X12=12 Marks)

a What are the advantages and disadvantages of DSB-SC as compared to standard AM.
b What is the condition to avoid diagonal clipping in envelope detector.
c A broadcast AM transmitter radiates 50KW of carrier power. What will be the radiated power at 85% modulation?
d Draw the frequency spectrum of VSB.
e What is Quadrature-null effect in DSB-SC.
f What are the advantages of VSB over SSB-SC.
g State Carson's rule.
h What is the unit for frequency sensitivity and Phase Sensitivity.
i Define Angle modulation.
j Define Capture Effect in FM.
k Why the noise performance of FM system will always be better than that of AM?
l Define Figure of merit.

**UNIT I**

2.a Explain the generation of AM wave using Switching modulator with relevant equations. 6M

2.b A carrier wave with amplitude 12V and frequency 10MHz is amplitude modulated to 50% level with a modulated frequency of 1KHz. Write down the equation for the above wave and sketch the modulated signal in frequency domain. 6M

**(OR)**

3.a With a neat block diagram, explain the operation of Quadrature-Carrier multiplexing. 6M

3.b Explain the method of obtaining a practical synchronous receiving system with DSB-SC modulated waves using COSTAS LOOP. 6M

**UNIT II**

4.a Explain the concepts of Hilbert transform, Pre-envelope and Complex envelope. 6M

4.b Draw and explain Phase discrimination method of SSB-SC. 6M

**(OR)**

5.a With a neat block diagram explain the operation of FDM technique. 6M

5.b Define VSB and explain the Envelope detection of VSB wave plus carrier. 6M

**UNIT III**

6.a Derive the mathematical expression for a single tone frequency modulated wave. 6M

6.b Discuss the FM generation using Indirect method. 6M

**(OR)**

7.a Explain with relevant mathematical expression the demodulation of a FM signal using PLL. 8M

7.b A carrier wave of 100MHz is frequency modulated by a 100KHz sine wave of amplitude 20V, the sensitivity of the modulator is 25KHz/V. 4M

i) Determine the frequency deviation and bandwidth of the modulated signal using Carson's rule.

ii) Repeat your calculation for PM wave, assume $K_p=K_f$.

**UNIT IV**

8.a What is meant by a threshold effect, explain how to reduce in FM? 6M

8.b Explain Pre-emphasis and De-emphasis in FM. 6M

**(OR)**

9.a Explain the demodulation of Pulse Amplitude modulation. 6M

9.b Derive the expression for Figure of merit for the SSB-SC receiver using Coherent detection. 6M