THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.301 ENGINEERING MATHEMATICS-II (ABCEFHMNPRSTU)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 4 marks*

1. A particle moves so that its position vector is given by $\vec{r} = coswt\,\hat{\imath} + sinwt\,\hat{\jmath}$, show that the velocity $\overrightarrow{V}$ of the particle is perpendicular to $\vec{r}$.

2. If $f(x) = x\,,\ o < x < \frac{\pi}{2}$

$= \pi - x\,,\ \frac{\pi}{2} < x < \pi$. Show that $f(x) = \frac{4}{\pi}\left(sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \cdots\right)$

3. Find the cosine transform of $f(x) = sinx$ in $0 < x < \pi$.

4. Solve the partial differential equation if $\frac{\partial z}{\partial x} = 6x + 3y$; $\frac{\partial z}{\partial y} = 3x - 4y$.

5. State the assumptions involved in the derivation of one dimensional Heat equation.

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. a) Find the constants a and b so that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$, may cut orthogonally at the point $(1, -1, 2)$.

b) If φ is a scalar point function, use Stoke's theorem to prove that $Curl(grad\ \varphi) = 0$.

c) Evaluate by Green's theorem in the plane for $\int_C (y - sinx)dx + cosx\,dy$ where C is the boundary of the triangle whose vertices are $(0,0), (\frac{\pi}{2}, 0)\ and\ (\frac{\pi}{2}, 1)$.

7. a) If $\vec{r} = x\,\hat{\imath} + y\,\hat{\jmath} + z\,\hat{k}$ prove that $\nabla r^n = nr^{n-2}\,\vec{r}$ where $r = |\vec{r}|$.

b) Show that $\vec{F} = e^x\left[(2y + 3z)\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right]$ is irrotational and find its scalar potential.

c) Using divergence theorem, evaluate $\iint_S F.\hat{n}\,ds$ where $\overrightarrow{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ and S is the surface bounding $x^2 + y^2 = 4, z = 0$ and $z = 3$

MODULE-II

8. a) Obtain the Fourier series of the function $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $(0,2\pi)$

b) Find the Fourier transform of $f(x) = 1$, $|x| < a$

$= 0$, $|x| \geq a$

Hence evaluate $\int_0^\infty \frac{sinx}{x} dx$

9. a) Find the Fourier series of $f(x) = -x + 1$, $-\pi \leq x \leq 0$

$= x + 1$, $0 \leq x \leq \pi$

b) Find the Fourier cosine transform of $f(x) = e^{-4x}$ and

hence show that $\int_0^\infty \frac{cos2x}{x^2+16} dx = \frac{\pi}{8} e^{-8}$

MODULE-III

10. a) Solve the pde $pxy + pq + qy = yz$.

b) Solve the pde $(D^2 - DD' + 2D'^2)z = e^{3x+4y} + \sin(x - y)$

11. a) Solve the partial differential equation $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$

b) Solve the pde $(D^2 + DD' - 6D'^2)z = ycosx$

MODULE-IV

12. a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial t} = u$ given that

$u = 3e^{-5x} + 2e^{-3x}$ when $t = 0$.

b) A string of length l is fixed at both the ends. The midpoint of the string is taken to a height b and then released from rest in that position. Find the displacement of the string.

13. a) Solve $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition, $u(0,t) = 0 = u(\pi,t)$ and

$u(x,0) = \pi x - x^2$ in $(0,\pi)$

b) A rod of length l has its ends A and B kept at 0^0C and 100^0C respectively until steady conditions prevail. The temperature at A is suddenly raised to 25^0C and at the same time that B is lowered to 75^0C and the end temperatures are thereafter maintained. Find the temperature function $U(x,t)$.

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.302 SIGNALS AND SYSTEMS (AT)

MODEL QUESTION PAPER

Time: **3 Hours** Maximum Marks: **100**

PART A

*Answer **all** questions. Each question carries 2marks.*

1. Define the following continuous functions.
(a) Signum function (b) Sync function

2. Determine the odd and even part of the signal, $x(t) = (1+t^3)\cos^3 10t$

3. Find whether the signal given by x (n) = 5cos (6-n) is periodic

4. What are the conditions for distortionless transmission of a signal?

5. Write down the relationship between Laplace Transform and Fourier Transform.

6. Write down the Drichlet conditions for existence of Fourier Transform of a continuous time signal.

7. Explain the term aliasing.

8. Write down the properties of Hilbert Transform.

9. Write a note on ROC of Z transform.

10. What is meant by correlation in Z transform?

(10 x 2Marks=20 Marks)

PART B

*Answer any **one** question from each module. Each full question carries 20 Marks*

MODULE – I

11. Plot the signals

(a) y(t) = u(t+1)-2 u(t-1) + u (t-3) (6 Marks)

(b) y(t) = x1(t)+x2(t), where $x1(t) = \begin{cases} 1; & 0 < t < 1 \\ 2; & 1 < t < 2 \\ 1; & 2 < t < 3 \end{cases}$ $x2(t) = \begin{cases} t; & 0 < t < 1 \\ 1; & 1 < t < 2 \\ 3-t; & 2 < t < 3 \end{cases}$

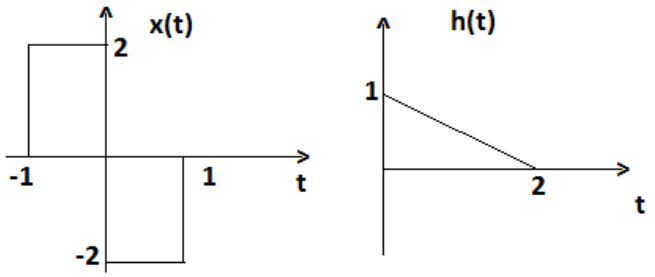
(6 Marks)

(c) Check whether the following signals are Energy signals or power, Also determine energy / power.

(i) $x(t) = A\cos(\omega_0 t + \theta)$ (ii) $x(t) = u(t+1)$ (8 Marks)

12. (a) Determine the convolution of signals $\mathbf{x_1(t) = cost\ u(t),\ x_2(t) = tu(t)}$. (4 Marks)

(b) Graphically determine the convolution of signals

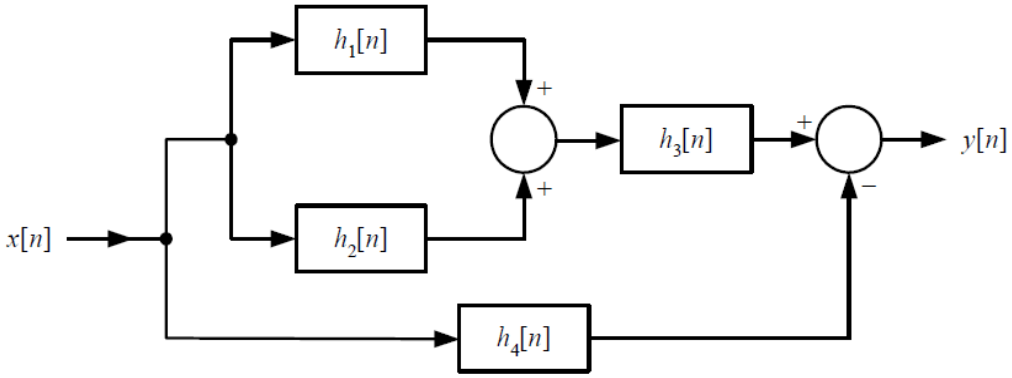


(8 Marks)

(c) Check for shift variance, linearity, causality the systems represented by

$Y(t) = 3x(t^2)$ (3 Marks)

(d) Obtain the overall impulse response of the system shown below. (5 Marks)



MODULE - II

13. (a) Find LT of $x(t) = e^{2t}\ (u(t) - u(t-4))$ (4 Marks)

(b) Verify initial value theorem for the function $\mathbf{x(t) = 2 - e^{5t}}$ (4 Marks)

(c) Find the inverse Laplace Transform of $\log\left[\frac{1+s}{s^2}\right]$ (4 Marks)

(d) Define Parseval's theorem for Continuous time Fourier Series. (2 Marks)

(e) Find the complex exponential Fourier series representation of the signal given by

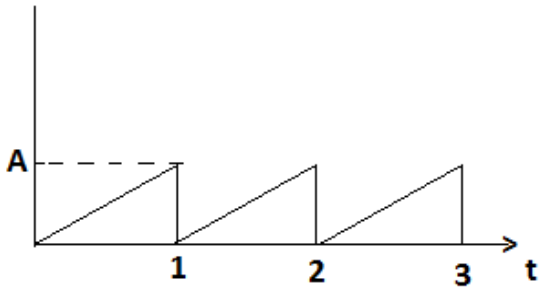
$\mathbf{x(t) = \cos \omega_0 t}$ (6 Marks)

14. (a) Plot Magnitude spectrum and Phase spectrum of the signal $\mathbf{x(t) = e^{-at} u(t)}$.

(6 Marks)

(b) Expand the function x(t) shown, by trigonometric Fourier series over interval (0,1).

(6 Marks)



(c) Write down the time convolution property of Fourier Transform (4 Marks)

(d) State and prove convolution theorem of Fourier series. (4 Marks)

MODULE - III

15. (a) State and explain the Sampling Theorem. (4 Marks)

(b) What are the different sampling techniques? Explain in detail. (8 Marks)

(c) A band limited signal x(t) is sampled by a train of pulses of width τ and period T. Determine the spectrum of sampled signal and sketch it. Also find expression for sampled signal. (8 Marks)

16. (a) Write down four properties of Hilbert Transform. (6Marks)

(b) Explain the pre envelope of Continuous time signal. (5 Marks)

(c) Write a note on Discrete Hilbert Transform. (3 Marks)

(d) Explain aliasing with help of figures. How it is eliminated. (6 Marks)

MODULE - IV

17. (a) What is the relation between DTFT and Z transform. (3 Marks)

(b) Determine Z transform of the function given by $x(n) = \begin{cases} 0, n \geq 0 \\ a^n, n < 0 \end{cases}$

(6Marks)

(c) Determine Z transform and ROC of the signal x(n) = u(n) – u (n-8) (6 Marks)

(d) Find DTFT of the sequence $\mathbf{x(n) = -a^n u(-n-1)}$ (5 Marks)

18. (a) Find the Inverse Z transform of the signals

(i) $X(Z) = \frac{1}{1-15\,z^{-1}+0.5z^{-2}}$ for ROC $|z| > 1$ (4 Marks)

(ii) $X(Z) = \frac{5z^3-29\,z^2+8z+60}{z^2-7z+10}$ (4 Marks)

(b) Write down properties of ROC of Z transform. (4 Marks)

(c) Derive the convolution property of Z transform. (4 Marks)

(d) Determine the discrete time Fourier transform of x(n)=an u(n) for -1<a<1

(4 Marks)

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.303 NETWORK ANALYSIS (AT)

MODEL QUESTION PAPER

Time: **3 Hours** Maximum:100 Marks

PART A

*Answer **all** questions. Each question carries 2marks.*

1. What is a dual network?
2. State superposition theorem.
3. Define impulse and step function.
4. What is complex frequency?
5. List 2 properties of driving point function.
6. Obtain Laplace transform of $x(t) = \cos \omega t$ from fundamentals.
7. Define Q factor & selectivity.
8. Explain dot rule for complex circuits.
9. State two properties of RL driving point impedance function.
10. What is causality? Give its significance.

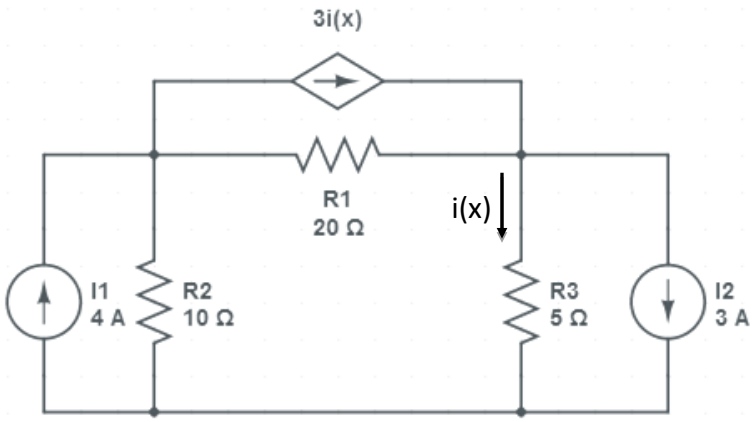
[10x2 = 20 marks]

PART B

*Answer any **one** question from each module. Each full question carries 20 marks*

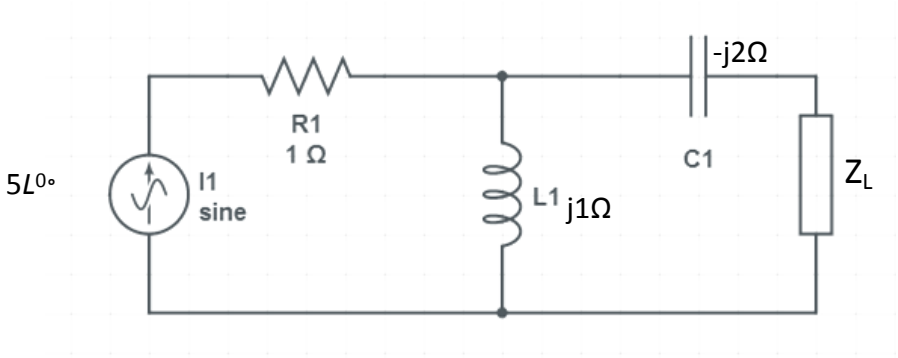
MODULE - I

11. (a)Using node analysis, determine i_x



(b) Draw the waveforms of unit impulse, step and ramp. Write down their mathematical expressions and the relationship between them.

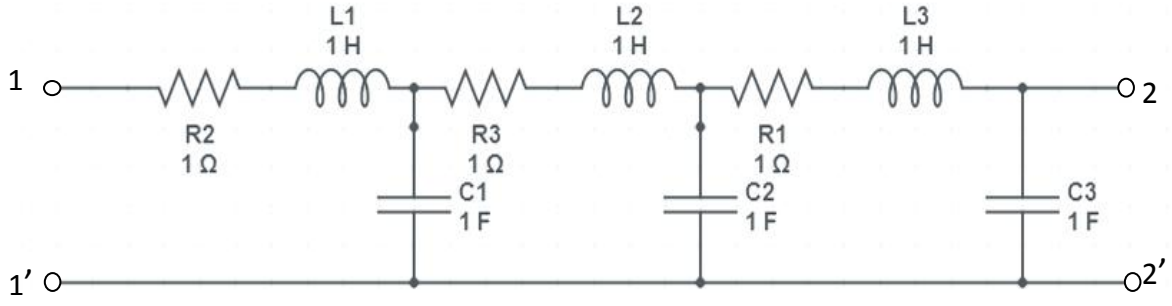
12. (a) In the network shown below, the load impedance is a complex quality. Find Z_L for the maximum power transfer. Also find the amount of maximum power transferred to the load.



(b) Explain (i) Graph (ii) Tree (iii) Cut-set matrix

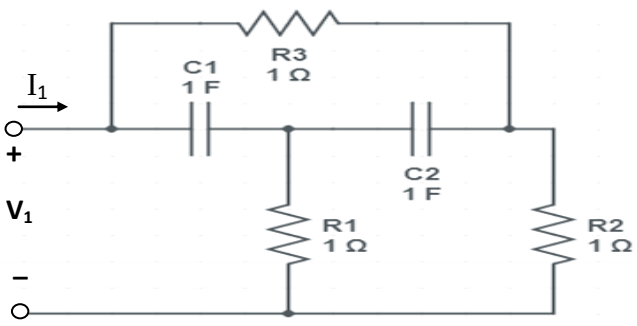
MODULE - II

13. (a) Find the open circuit driving point impedance of the following ladder network.



(b) Obtain Laplace transform of a Gate pulse of width 2 sec and height 10V. Also prove initial value theorem.

14. (a) For the circuit shown, obtain the driving point admittance $Y_{11}(s)$ in Laplace domain.



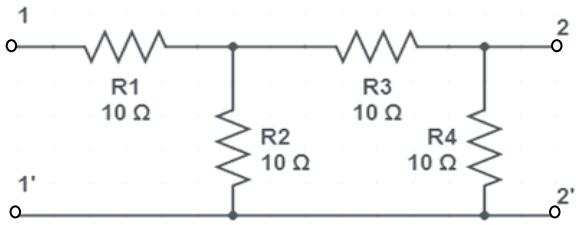
(b) Draw pole-zero plot and hence obtain V(t) for the following network function

$$V(s) = \frac{4(s+2)\,s}{(s+1)\,(s+3)}$$

MODULE - III

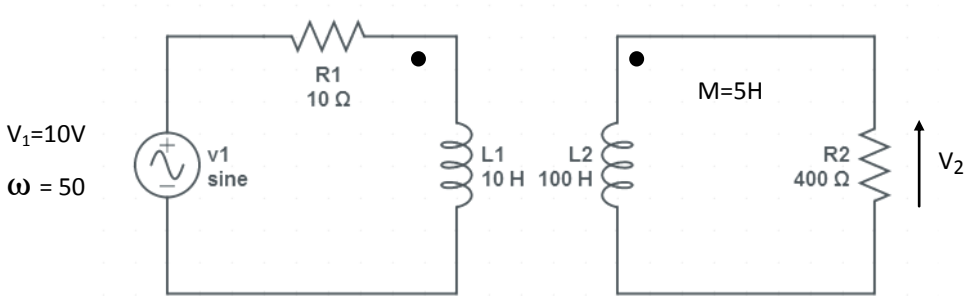
15. (a) Find the h – parameter for the network. Check whether the network is

(i) Reciprocal (ii) Symmetric



(b) Show that the resonant frequency of an RLC circuit is the geometric mean of the lower and upper half power frequencies.

16. (a) For the coupled circuit, find the ratio of output voltage to source voltage.



(b) Define image and characteristic impedance. Obtain image impedance of a T network.

MODULE - IV

17. (a) What are the characteristics of a positive real function ?

(b)Prove that the polynomial $s^4 + s^3 + 2s^2 + 3s + 2$ is not Hurwitz.

18. (a) Synthesize the first and second Foster networks for the impedance.

$$Z(s) = \frac{(s+1)(s+4)}{(s+3)(s+5)}$$

(b) Realize the RC impedance function by a Cauer form and a Foster form.

$$Z(s) = \frac{(s+2)(s+5)}{(s+3)(s+1)}$$

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: ELECTRONICS and COMMUNICATION ENGINEERING

13.304 ANALOG COMMUNICATION (T)

MODEL QUESTION PAPER

Time: **3 Hours** Maximum Marks: **100**

PART A

Answer all questions. Each question carries 2 marks

1. Define modulation coefficient and percent modulation

2. What is a pilot carrier?

3. What is a product modulator?

4. What are the primary functions of the front end of a receiver?

5. Define image frequency rejection ratio

6. What is the relationship among receiver noise, bandwidth, and temperature?

7. Define preemphasis and deemphasis

8. Describe the significance of the FM noise triangle

9. List the essential component of a standard telephone set.

10. What is a local office telephone exchange?

(10x2=20Marks)

PART B

Answer any one question from each module .Each full question carries 20marks.

MODULE I

11. a) Derive the relationship between the total power and carrier power in an AM wave.

b) Draw the block diagram of a filter type SSB transmitter and explain.

c) For a AM DSBFC modulator with a carrier frequency of100KHz and a maximum modulating signal of 5KHz. Draw the output frequency spectrum and determine the bandwidth.

12. a) Prove that the balanced modulator produces an output consisting of sidebands only.

b) Draw the block diagram of a phase shift SSB transmitter. Briefly describe its operation. List the advantages and disadvantages of this method.

MODULE II

13. a) Draw the block diagram of a superheterodyne AM radio receiver. Describe the functions of each block.

b) A receiver connected to an antenna whose resistance is 50 ohms has an equivalent noise resistance of 30 ohms. Calculate the receiver's noise figure in decibels and its equivalent noise temperature.

14. a) List and discuss the factors influencing the choice of IF for a radio receiver.

b) Determine the equivalent noise temperature for an amplifier with a noise figure of 6dB and an environmental temperature T=27°C.

MODULE III

15. a) Describe the basic operation of a varactor diode FM generation.

b) For an FM modulator with a peak frequency deviation of 40KHz, modulation signal frequency of 10KHz, determine its bandwidth.

16. a) Draw the schematic diagram for a Foster -Seely discriminator and describe its operation.

b) Describe the significance of the FM noise triangle.

MODULE IV

17. a) Explain the relationship between dynamic range, resolution, and the number of bits in a PCM code.

b) Discuss the components of an electronic telephone with the help of diagram.

18. a) Explain the basic purpose of call progress tones and signals in telephone system.

b) List and describe three types of crosstalk.

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: ELECTRONICS and COMMUNICATION ENGINEERING

13.305 ELECTRONIC CIRCUITS (T)

MODEL QUESTION PAPER

Time: **3 Hours** Maximum Marks: **100**

PART A

*Answer **all** questions. Each question carries 2marks.*

1. Define rise time?

2. Draw the circuit of a clipper that clips at +3 volts?

3. Compare input and output impedance of CS and CG MOS amplifies?

4. Draw the transfer characteristics of MOS differential amplifier?

5. Sketch the current mirror circuit?

6. Mention the effects of negative feedback on amplifier performance?

7. Differentiate between synchronous tuning and stagger tuning?

8. Compare the power amplifiers?

9. Define ripple factor and write the expression for ripple factor of a bridge rectifier?

10. What is the significance of peak inverse voltage of the diode in rectifier design?

(10x2=20Marks)

PART B

*Answer any **one** questions from each module Each full question carries 20marks.*

MODULE - I

11. Elaborate on integrator circuit. Discuss its response for step, pulse and square wave inputs. Also derive the condition for the circuit to work as an integrator? (20)

12. (a) Draw the small signal equivalent circuit of a CC amplifier and derive the expression for input resistance, output resistance, voltage gain and current gain. (12)

(b) An emitter follower circuit is having beta = 100 and R_1 = 30K, R_2 = 5K, V_{cc} = 20V. Calculate R_i and A_v? (8)

MODULE II

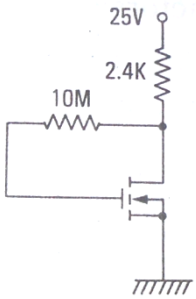
13. (a) For a common source MOSFET amplifier, the following parameters and circuit components are given: $V_{GS}(Q)$ = 2.12 V, V_{DD} = 5 V, R_D = 2.5 K, V_{TH} = 1 V, K_n = 0.8

mA/V^2 and Z = .02/V. Assume the transistor is in saturation, determine its voltage gain. (10)

(b) Analyze a MOS differential amplifier and obtain the expression for the CMRR. (10)

14. (a) What is body effect? Deduce the small signal equivalent circuit of an n-channel MOSFET including body effect? (10)

(b) For the n-channel enhancement MOSFET shown, $V_T = 5$ V, $K_n = 0.3$ mA/V^2. Determine I_D and V_D. (10)



MODULE III

15.(a) Draw the small signal equivalent circuit of a series feedback amplifier and derive the expression for input resistance, output resistance and voltage gain with feedback? (12)

(b) An amplifier with open loop voltage gain 2000±150 is available. It is necessary to have an amplifier whose voltage gain varies no more than ±0.2%. Find the reverse transmission factor beta and the gain with feedback. (8)

16. Draw the circuit of a Wien bridge oscillator and explain its working. Also derive the expression for frequency of oscillation and condition for oscillation? (20)

MODULE IV

17. (a) With relevant sketches explain the working of bootstrap sweep Circuit? (10)

(b) Derive the expression for conversion efficiency, total load power, collector dissipation and figure of merit of a transformer coupled power amplifier? (10)

18. (a) Draw the circuit of a series voltage regulator and explain its working? Also derive the expression for input regulation factor and output resistance? (10)

(b) The load resistance of a full wave rectifier is 0.5k. The transformer rating is 230/30-0-30V. The diode resistance is 50Ω. Calculate

(i) the peak, average and rms value of current, (ii) average value of the dc, (iii) the power output (iv) efficiency and ripple factor? (10)

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: ELECTRONICS and COMMUNICATION ENGINEERING

13.306 DIGITAL ELECTRONICS (T)

MODEL QUESTION PAPER

Time: **3 Hours** Maximum Marks: **100**

PART A

*Answer **all** questions. Each question carries 2marks.*

1. Convert the following numbers into decimal $(82A.3B)_{16}$, $(734)_8$

2. Obtain the canonical form of expression $F(a,b,c,d) = b^{l}d + abc^{l} + abd^{l} + a^{l}b^{l}d$

3. What is a sequential code? Write an example.

4. Explain race around condition in JK flip-flop.

5. Write down the characteristic equation of D flip-flop.

6. What are the advantages and disadvantages of ripple counter?

7. Differentiate Moore and Mealy machines.

8. Differentiate RAM, ROM, PROM & EPROM.

9. What are the merits and demerits of TTL family?

10. Write a VHDL program for a full adder.

(10x2=20Marks)

PART B

*Answer any **one** question from **each** module. Each full question carries 20marks.*

MODULE 1

11. (a) Simplify the following Boolean function using K-map method

(i) $F(A, B, C, D) = \Sigma (0,1,2,5,8,9,10,15)$

(ii) $F(A, B, C, D) = \Pi (0,3,4,6,7,11,12,13,14)$

(b) Design a combinational circuit to compare A & B and get an output when A > B. Aand B are two bit binary numbers.

12. (a) Using Quine-McCluskey method reduce the following

$f(a, b, c, d) = \Sigma (1, 2, 3, 5, 6, 7, 8, 12, 13, 15)$

(b) Design a 4: 1 multiplexer using NAND gates.

MODULE II

13. Design a synchronous counter using JK flip-flop to count the sequence 1-3-5-7. Avoid lock out stages by bringing the counter to state '1' always. Draw the circuit.

14. (a) Draw the internal diagram of 555 and explain.

(b) Design an astable multivibrator of frequency 1 KHz & 50% duty cycle using 555.

MODULE III

15. (a) Explain with the help of an example how a Moore machine is converted into a Mealy machine.

(b) Draw Moore and Mealy notation of a JK flip-flop.

16. Design a sequence detector to detect a sequence '110101' in a stream of bits.

MODULE IV

17. Draw a TTL NAND gate circuit and explain why totempole output stage is necessary and also draw the transfer characteristics.

18. (a) Draw the circuit schematic of a dynamic RAM cell and explain its operation. How the data stored in the cell is refreshed?

(b) Explain how two 16 x 4 RAMs are combined to achieve 16 x 8 module

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