(Please write your Exam Roll No.) Exam Roll No. 101

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2011

Paper Code: ETEC205 Subject: Circuits & Systems

Time : 3 Hours Maximum Marks :75

Note: Attempt any five questions including Q.no.1 which is compulsory. Any data explicitly not given may be assumed.

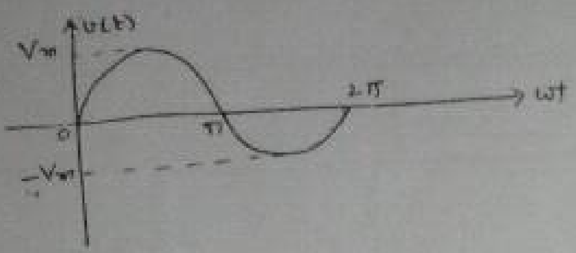
Q1 (a) Give the mathematical description and graphical representation of fire test signals used in electric circuits.

(b) What are the advantages of using Laplace transforms in electric circuits?

(c) Define ABCD parameters for two port networks.

(d) What would be the efficiency of a system working under maximum power transfer conditions? Justify your answer.

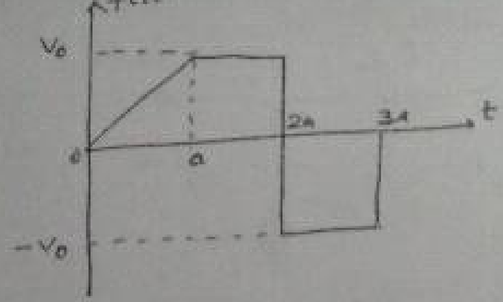
(e) Express $v(t)$, show in figure below using step signals. **(5x5=25)**



UNIT-I

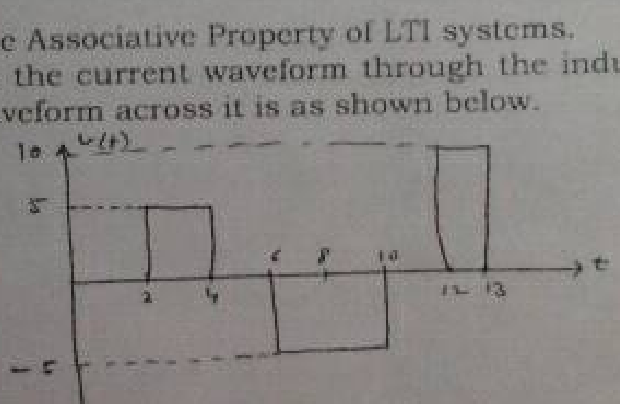
Q2 (a) Whether a system represented by the following response to excitation relation be considered as linear system for the purpose of principle of superposition or not? Justify your answer. Y=mx+c. **(5)**

(b) Express the following waveform by the standard signals. **(7.5)**



Q3 (a) Explain the Associative Property of LTI systems. **(5)**

(b) Determine the current waveform through the inductor of 0.1H, if the voltage waveform across it is as shown below. **(7.5)**



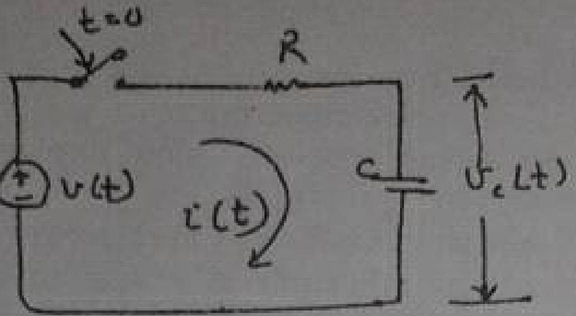
UNIT-II

Q4 State and illustrate with the help of examples the various theorems/properties of Laplace Transforms. **(12.5)**

P.T.O.

Q5 (a) Solve the following differential equation using Laplace transform method $\frac{dx}{dt}+x=Sin\omega t$ with $x(0^+)=2$. (5)

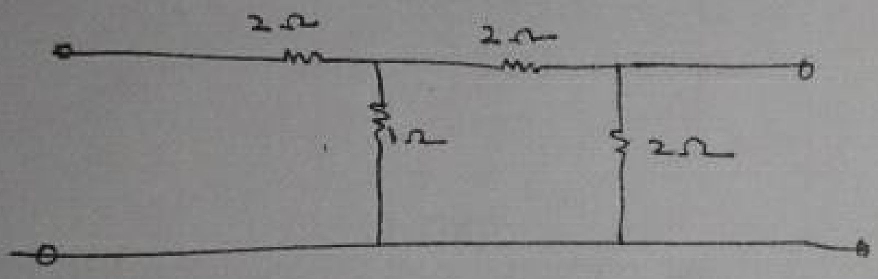
(b) Determine the voltage across the capacitance C as a function of time in the figure below, if a voltage pulse of unit height and width T is applied at t=0. (7.5)



UNIT-III

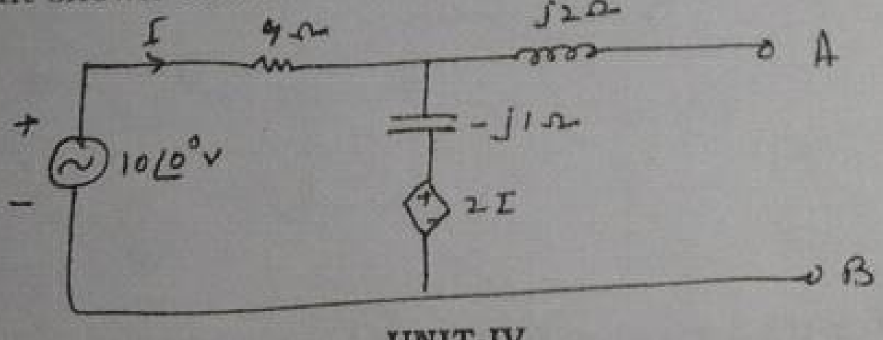
Q6 (a) In reference to graph theory state the properties of complete incidence matrix. (5)

(b) Determine Y-parameters for the network shown below- (7.5)



Q7 (a) State and illustrate with the help of an example the Norton's theorem in reference to electric networks. (5)

(b) Obtain Thevenin's equivalent circuit across AB terminals for the circuit shown below. (7.5)



UNIT-IV

Q8 (a) Check whether the polynomial given below is Hurwitz or not, $S^4+S^3-21S^2+8S+2$. (5)

(b) Check the following function is p.r. or not $F(S)=\frac{S^3+5S^2+9S+3}{S^3+4S^2+7S+9}$. (7.5)

Q9 (a) Realize $Z_{RL}(S)=\frac{4S^2+5S+1}{S^2+4S+1}$ in Caner-I form. (5)

(b) Realize $Z(S)=\frac{(S+2)}{(S+1)(S+3)}$ in Foster II form. (7.5)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2011

Code: ETIT209 Subject: Object Oriented Programming Using C++

3 Hours Maximum Marks :75

Note: Attempt any five questions including Q.no.1 which is compulsory.

(a) What is the role of 'new' operator in C++?
(b) What is containership? Explain with a suitable example.
(c) Differentiate between a base class and a derived class.
(d) How are constructors and destructors executed in multilevel inheritance?
(e) What are various types of inheritance?
(f) Which are the possible arithmetic operations with pointers? Give example.
(g) What do you mean by data abstraction?
(h) How garbage collection is done in C++?
(i) What are persistant objects?
(j) Explain object slicing with the help of an example. (2.5x10=25)

(a) What is Polymorphism? What are different types of polymorphism? Explain in detail. What are its merits and demerits? (8)
(b) Explain how exception handling is done in C++? (4.5)

(a) Write a program to copy the string by overloading '=' operator using 'this' pointer. (7.5)
(b) Differentiate between C and C++. (5)

(a) Write a program to determine what fraction of a given text consists of vowels? (6)
(b) What is a virtual function? Why are they required? (6.5)

(a) Explain how arguments are passed by a program to a function? (6)
(b) Create a class named shape. Using shape class, write a program to develop square and rectangle as the output. (6.5)

(a) Give an example to show how to use objects as the arguments in a function? (8.5)
(b) Explain type casting. What are explicit and implicit type conversions? (4)

What do you mean by generic classes? Give an example to explain generic classes using macros. How do you relate them with templates? (12.5)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2011

Paper Code: ETCS211 Subject: Data Structures

Time : 3 Hours Maximum Marks :75

Note: Attempt five questions including Q.no.1 which is compulsory.

Q1 (a) What is quicksort? Sort the following list in ascending order using quicksort:- 44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66 (1+2)

(b) For a two-dimensional array A(-2:2, 2:22), what is the address of element A(1,3), if base address is 400 and w=4 words per memory cell, using column-major order? (3)

(c) Compare the complexities in average case and worst case of the following sorting:- Merge Sort, Heap Sort, Quick Sort, Selection Sort. (4)

(d) Since binary search is very efficient, why would one want to use any other search algorithm? (2)

(e) What is priority queue? How priority queue can be represented in memory? (2)

(f) What do you mean by hashing? (1)

Q2 (a) What is AVL search tree? Explain LL, RR, LR and RL rotations in AVL search tree with examples. Construct an AVL tree by inserting the following elements in the order of their occurrence- 64, 1, 44, 26, 13, 110, 98, 85, 52, 120. (1+4+4)

(b) Write an algorithm for inserting a node after a given location in a circular linked list.(4)

(c) Discuss various ways for representation of sparse matrices in memory. (2)

Q3 (a) Explain Dijkstra Algorithm for shortest path with example. (6)

(b) Build a heap for the following list of numbers:- 44, 30, 50, 22, 60, 55, 77, 55. (3)

(c) Write Merge-Sort algorithm. (6)

Q4 (a) Write depth-first search algorithm of a graph. (6)

(b) Explain Floyd-Warshall Algorithm for shortest path with the help of example. (6)

(c) Consider a company with 68 employees. Each has been assigned a 4-digit employee number which is used as the primary key in the company's employee file. Suppose L (set of memory addresses of the locations) consists of 100 two-digit addresses: 00, 01, 02, ...99. Then apply the division method using a prime number closest to 99, mid square method and folding method to find out the 2-digit hash addresses for each of the following employee numbers: 9614, 5882, 1825. (3)

Q5 (a) The following sequence gives the preorder and inorder of the Binary Tree T-

Preorder	A	B	C	D	E	F	G	H	I
Inorder	D	G	B	A	H	E	I	C	F

Draw the diagram of the Tree. (4)

(b) Discuss the tradeoff in between the time and space complexity of program. (7)

(c) Derive the time-complexity of the Binary search in average and worst case. (4)

Q6 (a) Write an algorithm for transforming infix expressions into postfix expression and also convert the following infix expressions into postfix using stack: $A + (B * C - (D/E \uparrow F) * G) * H$. (6+3)

(b) Write an algorithm/program in C/C++ for bubble sort and also find out its complexity. (5+1)

Q7 (a) For a three-dimensional array A(2:8, -4:1, 6:10), find the number of elements and what is the address of element A(5, -1,8), if base address is 200 and w=4 words per memory cell using row-major order? (6)

(b) What are the threaded binary trees? Discuss their usability. (5)

(c) Describe in brief the indexed file organization technique. (4)

Q8 Write short notes on **any three** of the following:- (5x3=15)

(a) B-Tree

(b) Header linked list

(c) Garbage Collection and Compaction

(d) Inverted files

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2011

Paper Code: ETEC203 | **Subject: Signal & Systems**

Time : 3 Hours | **Maximum Marks :75**

Note: Attempt one question from each unit. Q.no.1 is compulsory.

Q1 (a) Obtain the convolution of the following sequence $x(n)=u(n)$, $h(n)=2^n u(n)$. **(4)**

(b) Check whether the following system is stable or not:- **(3)**

(i) $h(t)=te^{-t}u(t)$ (ii) $h(t)=e^{-2|t|}$.

(c) Derive the Persaval Theorem for Fourier Series. **(3)**

(d) Show that (i) $x(t)\cos\omega_0 t \xleftrightarrow{F.T} \frac{1}{2}X\left(j(\omega-\omega_0)\right)+\frac{1}{2}Xj(\omega+\omega_0)$ (ii) $F.T\{u(-t)\}$. **(4)**

(e) Evaluate the following integral:- **(3)**

(i) $\int_{-\infty}^{\infty}(3t^2+1)\delta(t)dt$ (ii) $\int_{-\infty}^{\infty} e^{-t}\delta'(t)dt$.

(f) Discuss the (i) Accumulator (ii) Time Expansion property of DTFT. **(4)**

(g) Derive the relationship between:- **(4)**

(i) Stability and ROC for discrete time signal.

(ii) DTFT and Z-transform

UNIT-I

Q2 (a) Compute the output y(t) of continuous time LTI system whose impulse response h(t) and input x(t) are given by $h(t)=e^{-at}u(t)$ and $x(t)=u^{at}u(-t)$, $a>0$. **(6)**

(b) Consider a continuous time system whose input x(t) and output are related by $\frac{d^2y}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=\frac{dx(t)}{dt}+4x(t)$ the input $x(t)=e^{-t}u(t)$. Compute the total response. **(6.5)**

Q3 (a) Find the response of the system described by the difference equation $y(n)-\frac{1}{2}y(n-1)+\frac{1}{2}y(n-2)=\left(\frac{1}{2}\right)^n$, $n>0$ for $y(-1)=1$, $y(-2)=0$. **(6.5)**

(b) Find the state space variable matrices A, B, C, D and the transfer function for the given input-output relationship $y(n)+3y(n-1)+2y(n-2)=x(n)+5x(n-1)+6x(n-2)$. **(6)**

UNIT-II

Q4 (a) (i) Discuss the property of Duality for continuous time Fourier transform. **(2)**

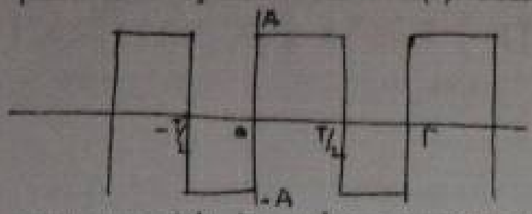
(ii) Compute the Fourier transform G(jω) for the signal $g(t)=\frac{2}{1+t^2}$. **(4.5)**

(b) (i) Let $x_1(n)$ and $x_2(n)$ be periodic sequence with fundamental period N_0 and there DFS is given by $x_1(n)=\sum_{K=0}^{N-1} dKe^{+jK\omega_0 n}$ and $x_2(n)=\sum_{K=0}^{N-1} eke^{+jK\omega_0 n}$. Compute the DFS for the sequence $x_3(n)=x_1(n)x_2(n)$. **(4)**

(ii) Determine DFS for the given sequence $x(n)=Cos^2\left(\frac{\pi}{8}n\right)$. **(2)**

P.T.O.

Q5 (a) Consider the periodic square wave x(t) compute its Fourier series coefficient. **(6.5)**



(b) Consider LTI system with impulse response $h(n) = \alpha^n u(n)$ and input $x(n) = \beta^n u(n)$, $|\alpha| < 1$ and $|\beta| < 1$. Compute y(n) for the following case (i) $\alpha \neq \beta$ (ii) $\alpha = \beta$. **(6)**

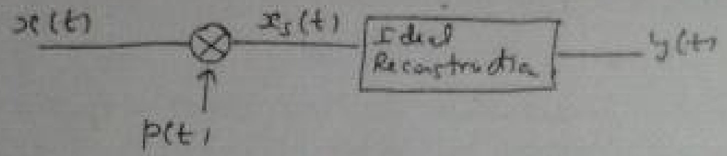
UNIT-III

Q6 (a) Discuss the following:- **(4)**

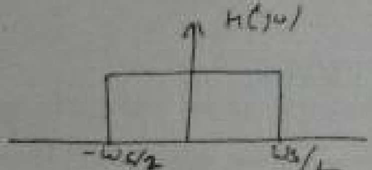
(i) All pass filter and group delay

(ii) Interpolation and Nyquist rate

(b) Consider the following sampling and reconstruction block. **(8.5)**



Ideal reconstruction filter has the following characteristic:-



For the signal sampled at T=1/150sec. Determine $X(j\omega)$, $X_s(j\omega)$ and $y(j\omega)$.

Q7 (a) A casual LTI system is described by the differential equation $\frac{dy(t)}{dt} + 2y(t) = x(t)$. Determine- **(8.5)**

(i) Frequency response (ii) Group delay of the system

(iii) Output of the system when $x(t) = e^{-t}u(t)$.

(iv) Output of the system when input $X(j\omega) = \frac{j\omega + 1}{j\omega + 2}$.

(b) Determine the Nyquist sampling rate for the following signal:- **(4)**

(i) $\sin^2(200\pi t)$ (ii) $x(t) = \frac{(400\pi t)}{\pi t}$.

UNIT-IV

Q8 (a) Find the impulse response and step response of LTI discrete time system $y(n) - 3/4\ y(n-1) + 1/8\ y(n-2) = x(n)$. **(6.5)**

(b) Determine all possible signal x(t) associated with Z-transform $X(Z) = \frac{5Z^{-1}}{(1-2Z^{-1})(1-3Z^{-1})}$. **(6)**

Q9 (a) Find the inverse Laplace transform of the following:- **(6)**

(i) $X(S) = \frac{S^2 + 6S + 7}{S^2 + 3S + 2}$ Re(S) > -1 (ii) $X(S) = \frac{S^3 + 2S^2 + 6}{S^2 + 3S}$ Re(S) > 0.

(b) The output y(t) of continuous time LTI system is $2e^{-3t}$ when input x(t)=u(t). Compute- **(6.5)**

(i) Impulse response h(n) (ii) Output when $x(t) = e^{-t}u(t)$.

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2011

Paper Code: ETEC207	***Subject: Analog Electronics-I***
Time : 3 Hours	***Maximum Marks :75***

Note: Attempt one question from each unit. Q.no.1 is compulsory. Graph paper is required.

Q1 (a) Explain the transient response of a diode when driven from ON to OFF state or vice versa.

(b) Discuss "Base Width Modulation' and explain its effects.

(c) Define the various stability factors and explain how to compute the total change in the collector current due to these.

(d) Derive the approximate conversion formulas for 'h' parameters from CE to CC configuration.

(e) Draw the equivalent circuit for four types of controlled amplifiers and explain the conditions under which these can be made to achieve ideal conditions. **(5x5=25)**

UNIT-I

Q2 (a) The circuit shown in fig.1 uses a silicon diode at room temperature. Given: V_r=0.6V, R_f= 10Ω. Compute (i) the a.c. voltage across load R_L. (ii) the total voltage across R_L (iii) the total current in the circuit. **(6.5)**

(b) Explain the reason for the 'Diffusion Capacitance, C_D' in a pn junction diode. Derive an expression for it. If a silicon diode has forward biased current, I_{DQ}=1mA and given that D_p=13, L_p=2.6cms. Compute the value of C_D. **(6)**

OR

Q3 (a) For a centre-tapped full-wave rectifier, show the current waveform for non-ideal diodes and derive the expression for I_{dc}. Also, find ripple factor, rectifier efficiency and PIV. **(6.5)**

(b) Explain the working of (i) Zener diode (ii) LED. Discuss one application for each. **(6)**

UNIT-II

Q4 (a) Show the various current components for a pnp transistor in active mode and explain its operation. **(3)**

(b) Explain the terms: (i) Early voltage, V_A (ii) I_{CEO} (iii) I_{CBO}. **(3)**

(c) Find the region of operation of the circuit shown in fig.2. Assume B_F=100, $V_{BE,active}$=0.7V, $V_{BE,sat}$=0.8V, $V_{CE,sat}$=0.2V, $V_{BE,cut off}$=0V. **(6.5)**

OR

Q5 (a) Derive an expression for the stability factor $S(I_{CO})$ for the circuit shown in fig.3. **(6)**

(b) For the amplifier shown in fig.4, the transistor parameters are: h_{ie}=1kΩ, h_{fe}=50, h_{oe}=25μA/S, and h_{re}=2.5x10^{-4}. Compute $A_{vs}=V_o/V_s$. **(6.5)**

UNIT-III

Q6 (a) Draw the circuit diagram of a two stage RC-coupled amplifiers. Explain the importance of each component. Draw and explain its frequency response. **(6)**

(b) Discuss the various feedback topologies. Draw a general feedback amplifier diagram and derive the expression for the closed loop gain. Discuss the advantages of negative feedback. **(6.5)**

OR

Q7 (a) Calculate the overall voltage gain of the BJT cascade shown in fig.5. Assume: h_{ie}=1kΩ, h_{fe}=100, h_{oe}=h_{re}=0. **(6.5)**

(b) Draw the circuit of feedback amplifiers for each of the four feedback topologies and justify the type of feedback. **(6)**

UNIT-IV

Q8 (a) Explain the construction, operation and volt-ampere characteristics of a JFET. **(6.5)**

(b) Explain the working and V-I characteristics of UJT. Discuss any one application. **(6)**

OR

Q9 (a) Draw the structure of an enhancement type NMOS transistor. Draw and explain the drain and transfer characteristics. **(6)**

(b) For the n-channel JFET amplifier shown in fig.6, determine V_{DSQ}, I_{DSQ}, V_D and V_S. Given I_{DSS}=6mA and V_P=-6V. **(6.5)**

P.T.O.

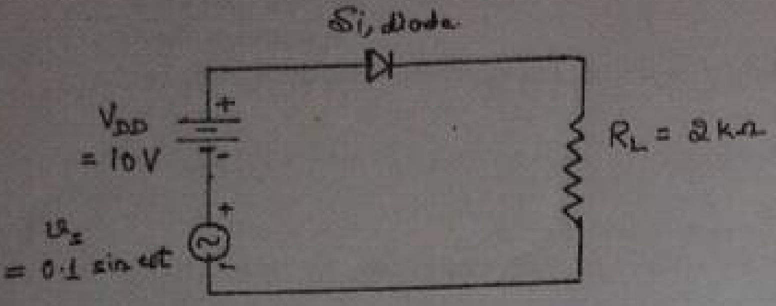

Fig. 1

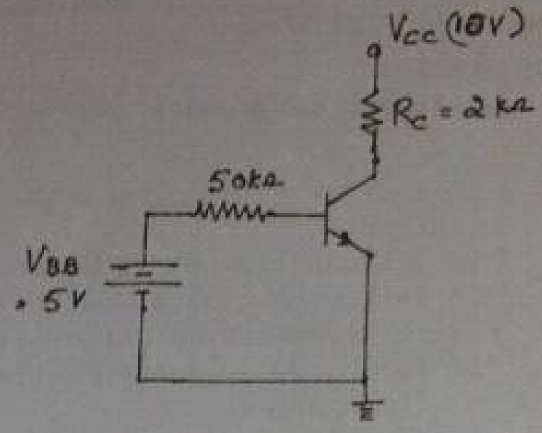

Fig. 2

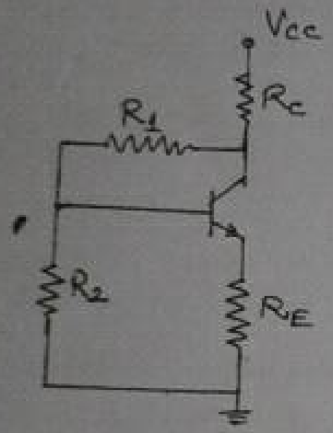

Fig. 3

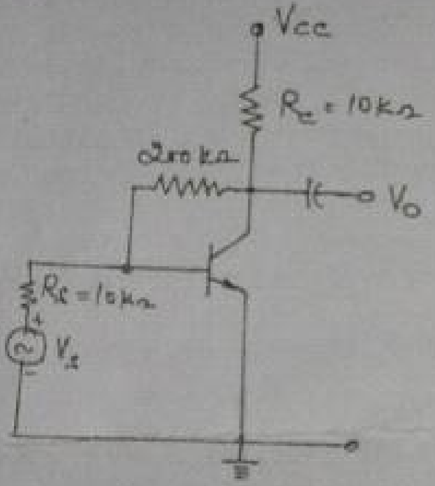

Fig. 4

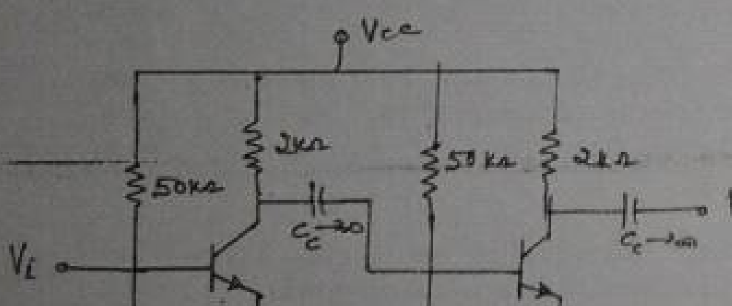

Fig. 5

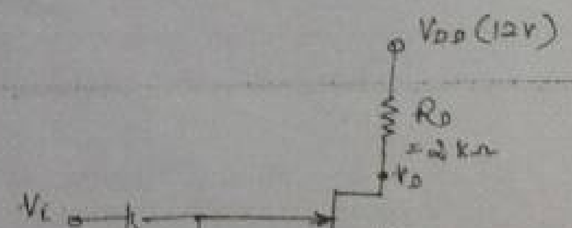

Fig. 6

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2011

Paper Code: ETMA201 Subject: Applied Mathematics

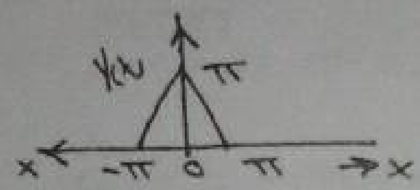
Time : 3 Hours Maximum Marks :75

Note: Attempt any five questions including Q.no.1 which is compulsory. Attempt any one question from each unit.

Q1 (a) If $f(s)$ is the Laplace transform of $f(t)$ then show that $\frac{1}{s}f(s)$ is the L transform of $\int_0^t f(u)du$ provided $\lim_{t \to 9} e^{-st}\int_0^t f(u)du$. **(3)**

(b) Express the function in terms of unit step function and hence find its Laplace transform $f(t) = 2t$ for $0 \le t \le 5$; $= 10$ for $t > 5$. **(3)**

(c) Find the Fourier Series for the function f(x) given as- **(5)**



(d) Express the polynomial $3x^3+2x^2+1$ in terms of Legendre's Polynomials. **(5)**

(e) If F(s) is the Fourier Transform of f(x) then show that $F\{f(ax)\} = \frac{1}{a}F(S/a)$. **(4)**

(f) Eliminate the arbitrary function 'f' from the following equation $Z = f(xy/z)$. **(5)**

UNIT-I

Q2 (a) Obtain Laplace transform of the function $f(t) = \sin t$ for $0 < t < \pi$; $= 0$ for $t > \pi$. **(6)**

(b) Find the inverse Laplace transform of $\frac{S}{S^4 + S^2 + 1}$. **(6.5)**

Q3 (a) Solve the differential equation $(D^2+1)x = t\cos^2 t$, given that $x(0) = 0 = \left(\frac{dx}{dt}\right)_{t=0}$. **(6)**

(b) If f(t) is a periodic function with period 'a' then find $L\{f(t)\}$. **(6.5)**

UNIT-II

Q4 (a) Find the Fourier Series to represent the function $f(x) = \cos ax$, $-\pi < x < \pi$ where 'a' is fraction. What will happen to Fourier Series if 'a' is integer. **(6)**

(b) Find a cosine series to represent the function $f(x) = x \sin x$ in the interval $(0, \pi)$. **(6.5)**

Q5 (a) Express $f(x)=x^2$ as a half range cosine series for $0<x<2$. **(6)**

(b) Express $f(x)=x^2$ in Fourier Series for $0<x<2$. **(6.5)**

P.T.O.

UNIT-III

Q6 (a) Show that $\sqrt{\frac{1}{2}} = \sqrt{\pi}$. **(6)**

(b) State and prove the orthogonality of Bessel's function of first kind of order n. **(6.5)**

Q7 (a) Show that $B(m, n) = \int_0^\infty \frac{y^{n-1}}{(1+y)^{m+n}} dy$. **(6)**

(b) Show that (i) $\int x J_0(x) dx = \frac{1}{2} x^2 \{J_0^2(x) + J_1^2(x)\} + C$ where C is constant of integration. (ii) $\int_{1}^{1} (1-x^2) P_m^1(x) P_n^1(x) dy = 0$ where m & n are different integer. **(3+3.5)**

UNIT-IV

Q8 (a) Form the PDE by eliminating the arbitrary functions from $z \quad yf(x) + xg(y)$. **(5)**

(b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$, $0 < x < l$, $0 < t < 4$, with boundary conditions and initial condition $u(x,0) = f(x)$ and $\frac{\partial u}{\partial t}\Big|_{t=0} = g(x), 0 \le x \le l$. **(7.5)**

Q9 (a) Obtain the equation governing the heat flow in a straight thin bar, which is insulated laterally, by assuming and improving other conditions suitably. **(6)**

(b) Find the temperature distribution in a laterally insulated bar of length 1 with both ends insulated and initial temperature in the rod being $\text{Sin}\left(\frac{x\pi}{1}\right)$. **(6.5)**

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