(Please write your Exam Roll No.)

Exam Roll No. ....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] JANUARY 2024

Paper Code: HS-301   Subject: Economics for Engineers

Time: 3 Hours   Maximum Marks: 75

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit.

Q1 Answer the following questions briefly:-
(a) Elaborate resource constraint as an economic problem. (3)
(b) Justify how indifference curve helps in understanding consumer's choice. (3)
(c) What is oligopoly market. (3)
(d) Define NNP, GNP, GDP. (3)
(e) State the Law of Demand. (3)

UNIT-I

Q2 (a) List the differences between Microeconomics and Macroeconomics. (5)
(b) List the factors effecting demand and supply. (5)
(c) Explain how Production Possibility Curve helps in product choice decisions. (5)

Q3 (a) Explain the circular flow of income in an economy. What does it measure? (8)
(b) Explain the elasticity of demand and supply with example. (7)

UNIT-II

Q4 (a) How Cardinal and Ordinal utilityare used to analyze consumer behaviour. (8)
(b) What is demand forecasting? List the features demand forecasting. How it proves a useful tool for decision makers. (7)

Q5 (a) List different methods of demand forecasting. Explain any two quantitative methods of demand forecasting. (8)
(b) Explain about consumer equilibrium. (7)

UNIT-III

Q6 (a) Define 'Cost'. How are costs classified? Explain any two important cost concepts useful for managerial decisions. (8)
(b) Distinguish between monopoly and perfect competition. (7)

Q7 (a) Define economics of scales and diseconomies of scales. (8)
(b) Differentiate between perfect competition and monopolistic competition? (7)

UNIT-IV

Q8 (a) What are the major macroeconomic issues directly related to business decision making? (8)
(b) Explain different phases of business cycle? (7)

Q9 (a) What is inflation. Briefly explain the features and types of inflation. (8)
(b) Explain different approaches used in calculating national income? (7)

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] JANUARY 2024

Paper Code: ECC-305   Subject: Microelectronics
Time: 3 Hours   Maximum Marks: 75

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Each question carry equal marks. Assume suitable missing data if any.

Q1 (a) Differentiate between enhancement and depletion type MOSFET. Which type is a preferred choice and why? Support your answer with relevant diagrams. **(2.5)**

(b) What is Moore's Law? With downscaling of device dimensions by a factor of 10, what would you expect for drain current will be ---- and --- times of the original value if constant field scaling and constant voltage scaling are used. **(2.5)**

(c) Draw the static CMOS logic circuit for the following expression: **(4)**
   (i) Y= (AB'CD)'   (ii) Y= [D(A+BC)]'
                                                    (1x6=6)

(d) Write short notes on:
   (i)   Channel Length Modulation
   (ii) Ferroelectric RAM
   (iii) Threshold Voltage
   (iv) Twin Tub Process
   (v)   Impact of increasing threshold voltage of NMOS transistor on CMOS VTC in terms of noise margins (VIL, VIH).
   (vi) CMOS vs BJT

UNIT-I

Q2 (a) An NMOS transistor, operating in the linear region with VDS = 50 mV, is found to conduct 25 μA for VGS = 1 V and 50 μA for VGS = 1.5 V. What is the apparent value of threshold voltage VT? If kn' = 50 μA/V2, what is the device W/L ratio? What current would you expect to flow with VGS = 2 V and VDS = 0.1 V? If the device is operated at VGS = 2 V, at what value of VDS will the drain end of the MOSFET channel just reach pinch-off? **(7.5)**

(b) Explain in detail a typical N-well CMOS fabrication process. Support it with suitable diagrams. **(7.5)**

Q3 (a) With the help of energy band diagram, explain the operation of MOSFET under external bias. **(7.5)**

(b) Derive the expression for IDS for NMOS transistor in non-saturation region and draw IDS vs VDS characteristics for enhancement mode MOS transistor. **(7.5)**

UNIT-II

Q4 (a) Design a CMOS inverter with switching threshold voltage of 2 /3 VDD. What is the resulting ratio of WP /WN ? (Assume LP = LN, μN = 2.5μP, |VTP|=VTN = 0.2 VDD). **(2.5)**

(b) Design the following Boolean functions using multiple output domino logic: **(5)**
   C1 = G1 + P1C0, C2 = G2 + P2G1+ P2P1C0, where Pi = Āi Oi +AiŌi , Gi = Ai Oi (i = 1,2,3)

(c) What is a pass transistor? Explain the different regions of operation of CMOS inverter. Support with a diagram. **(5)**

(d) Explain CMOS based NOR SR latch circuit and its working. **(2.5)**

P.T.O.

Q5 (a) Define Latch-up. Is it desirable? Give the ways to reduce the same in CMOS circuits. **(4)**

(b) Discuss dynamic CMOS logic. Consider a three input NOR gate. **(5)**

(c) An implementation of a D Flip-flop is show in Fig. Answer the following: **(6)**

   (i)   Is this a static or dynamic flip-flop?
   (ii) Is this positive edge triggered or negative edge triggered?
   (iii) Calculate tsetup, tCtoQ and thold for this flop in terms of the transmission gate and inverter delays.
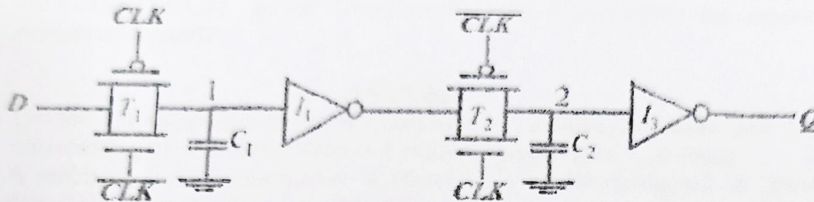
UNIT-III

Q6 (a) Explain the difference between cascade current mirror and Wilson current mirror with diagrams. **(7.5)**

(b) Explain the compensation of op-amps. **(7.5)**

Q7 (a) Develop CMOS Differential amplifier and obtain the differential Transconductance of the same. **(7.5)**

(b) Derive the expression for power-supply rejection ratio of Two-stage op-amps. **(2.5)**

(c) What is a current mirror circuit? Explain with the help of a circuit. **(5)**

UNIT-IV

Q8 (a) Explain read/write operation of SRAM memory cell. How 1 bit cell is used in bigger memory systems. **(7.5)**

(b) Distinguish between SRAM and DRAM. **(7.5)**

Q9 (a) Implement 2:1 MUX using CMOS transmission gate. **(5)**

(b) Write short notes on:
   (i) Analog to Digital Converters (ADCs) **(5)**
   (ii) Digital to Analog Converters (DACs) **(5)**

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] JANUARY 2024

Paper Code: ECC-309	**Subject: Transmission Lines, Waveguides and Antenna Design**
Time: 3 Hours	**Maximum Marks: 75**

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt all questions:-
(a) Define dominant, degenerate and evanescent modes. **(3)**
(b) Write wave equations for voltage and current for a transmission line. **(3)**
(c) Define loaded and unloaded Q for series and parallel resonance circuits. **(3)**
(d) Define the following with respect to antenna: **(3)**
  (i) Major lobe & Minor lobe
  (ii) Antenna efficiency & Radiation Efficiency
  (iii) Directivity & Gain of an antenna
(e) What is fringing in Microstrip transmission line? How to account for this in the microstrip transmission line? **(3)**

UNIT-I

Q2 (a) Derive impedance for shorted and open circuited transmission line. **(5)**
(b) A telephone line has R=30Ω/km, L=100 mH/km, G=0 and C=20µF/km. At f=1 KHz, obtain: **(5)**
  (i) Characteristics impedance of the line
  (ii) Propagation Constant
  (iii) Phase Velocity
(c) Write short note on the following **(any two)**: **(5)**
  (i) Characteristic Impedance
  (ii) Voltage standing wave ratio
  (iii) Reflection Coefficient

Q3 (a) Explain the design of the Smith Chart. Also explain how to find impedance at the distance 'l' from the load using Smith Chart. **(5)**
(b) A 600Ω lossless transmission line is fed by 50Ω generator. If the line is 200m long terminated by a load of 500Ω. Determine in dB, **(5)**
  (i) Reflection Loss
  (ii) Transmission Loss
  (iii) Return Loss
(c) Write short note on the following **(any two)**: **(5)**
  (i) Quarter wave transformer
  (ii) Stub matching
  (iii) Microstrip Transmission Line

UNIT-II

Q4 (a) Derive field components of TE waves in rectangular waveguide. Also deduce instantaneous field expressions for TE$_{01}$ mode. **(10)**
(b) In a rectangular waveguide for which a=1.5cm, b=0.8cm, σ=0, µ=µ$_0$ and ε=4ε$_0$. **(5)**

$$H_x = 2 \sin\left(\frac{\pi x}{a}\right) \cos\left(\frac{3\pi y}{b}\right) \sin(\pi X 10^{11} t - \beta z)\, A/m$$

P.T.O.

ECC-309

Determine:
(i) The mode of operation
(ii) The cutoff frequency
(iii) The phase constant
(iv) The propagation constant
(v) The internal wave impedance

Q5 (a) Derive field components of TE waves in circular waveguide. Show dominant mode in circular waveguide. **(10)**

(b) An air-filled circular waveguide having an inner radius of 0.8cm is excited in dominant mode at 10 GHz. Find the cut off frequency of dominant mode, guide wavelength and bandwidth for operating in dominant mode. **(5)**

UNIT-III

Q6 (a) Derive an expression for unloaded Q of a transmission line resonator consisting of a short-circuited transmission line $\lambda/2$ long. **(5)**

(b) A circular cavity resonator with d=2a is to be designed to resonate at 5.0 GHz in the TE_{011} mode. If the cavity is made from copper and is Teflon filled ($\epsilon_r=2.1$, $\tan\delta=0.0004$), find its dimension and unloaded Q. **(5)**

(c) Compute the resonant frequency of a cylindrical resonator with $\epsilon_r=10.8$, 2a=11.71mm and L=2.14mm. **(5)**

Q7 (a) Derive the unloaded Q for the TM_{111} mode of a rectangular cavity, assuming lossy conducting walls and lossless dielectric. **(5)**

(b) A rectangular cavity resonator is constructed from 3.0 cm length of aluminum X-band waveguide. The cavity is air filled. Find the resonant frequency and unloaded Q of the TE_{101} and TE_{102} resonant modes. **(5)**

(c) Explain in detail development of gap-coupled microstrip resonator. **(5)**

UNIT-IV

Q8 (a) Define and derive power spectral density of an antenna. Establish relation between radiation intensity and total power radiated by an antenna. **(7)**

(b) Derive Friis transmission equation for transmitting and receiving antennas. **(5)**

(c) An antenna has a normalized radiation intensity given by $U(\theta)=\cos^2(3\theta)$ for $0\leq\theta\leq\Pi/2$ and $0\leq\varphi\leq2\Pi$. Find HPBW and FNBW in degrees. **(3)**

Q9 (a) Obtain the expression for Electric Field Intensity and Magnetic Field Intensity due to magnetic vector potential A for electric current source J only. Write expressions for $\vec{E}$ and $\vec{H}$ for Magnetic current source $\vec{M}$ using duality theorem. **(10)**

(b) State Reciprocity theorem for antennas in differential and integral form. **(5)**

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ECC-309

END TERM EXAMINATION

FIFTH SEMESTER (B.TECH) JANUARY-2024

Paper Code: ECC-311   Subject: Data Communication & Networking

Time: 3 Hours   Maximum Marks :75

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

Q1 (a) What are the responsibilities of Transport Layer? Explain   (2.5)
    (b) What are the differences between Router and Switch?   (2.5)
    (c) What do you understand by tunnelling?   (2.5)
    (d) Explain the differences between Adaptive and NON Adaptive Routing. (2.5)
    (e) Explain the design issues of Data Link Layer   (2.5)
    (f) Define the following terms: (i) Full Duplex, (ii) Burst Error, (iii) Firewall (2.5)

UNIT- I

Q2 (a) What are the differences between TCP/IP and OSI model   (7)

    (b) Write short note on network topologies of WAN.   (8)

Q3 (a) Explain the importance and functionality of guided media in detail. (7)
        Explain the types of guided media in detail.

    (b) Explain Circuit Switching and Packet Switching in detail with example (8)
        for each specific type? Provide diagrams for the two types of Packet
        Switching that is (a) datagram and (b) virtual circuit switching.

UNIT- II

Q4 (a) Discuss Stop and Wait ARQ error control in data link layer   (7)

    (b) Explain in detail the design issues of Data Link layer.   (8)

Q5 (a) Compare and contrast the Go-Back-N ARQ protocol with Selective repeat (7)
        ARQ.
    (b) Explain the error detection techniques. Encode a binary word 11001 (8)
        into the even parity hamming code.

UNIT- III

Q6 (a) Differentiate between IPv4 and IPv6   (7)

    (b) Explain Shortest path Routing Algorithm with suitable example   (8)

Q7 (a) What are the role of IP address ? Explain its different classes   (7)

    (b) Explain Leaky Bucket Algorithm with suitable example   (8)

UNIT- IV

Q8 (a) What is ATM. Give its architecture?   (7)

    (b) Discuss about congestion control and traffic management.   (8)

Q9 (a) Write a short note on Dynamic Host Configuration Protocol (DHCP)   (7)

    (b) Write a short note on Hypertext Transfer Protocol   (8)

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