Total No. of Pages 02

Roll No. EP/024

FOURTH SEMESTER

B.Tech. (EP)

END SEMESTER EXAMINATION

May-2019

EC272 COMMUNICATION SYSTEM

Time: 3 Hours

Max. Marks: 40

Note: Answer **ALL** questions.

Assume suitable missing data, if any.

Q1: i) What are the important factors that are responsible for bandwidth requirement? Show the bandwidth for telephone, audio and video signals in pictorial form. Classify the important elements of communication system along with steps and structure involved in the process of electronic communication? **(04)**

ii) Explain the necessity of modulation in carrier transmission through three important reasons? Explain the difference between digital and analog modulation? **(03)**

iii) Show the three important components of a typical network along with its sub components in detail with diagram? What are the scopes, limitations, reason of errors in communication system? **(03)**

Q2: i) Describe the signals and its classifications? Mention its types with representations? Define equivalent noise bandwidth? **(05)**

ii) Explain equivalent noise temperature and its use in microwave frequencies? What is modulation factor and its importance? Mention the limitations of Amplitude Modulation? **(05)**

Q3: i) A 100 V, 10 kHz carrier is modulated with the help of a 5V, 50 Hz signal. Calculate: i) Modulation factor (m), ii) Amplitude of each sideband, iii) Frequency of each sideband, iv) Bandwidth of modulated wave. **(04)**

ii) Show the process of Amplitude Modulation (AM)? What are sideband frequencies in AM wave? Illustrate them with an example? If one of the sidebands is removed from the modulated output, will the signal transmission be affected? **(03)**

iii) Define noises and its classifications. Where it is most likely to affect the signal? What does modulation actually do to a message and carrier? Write short notes on flicker, recombination and solar noises. **(03)**

Q4: i) Discuss any **FIVE** from the following: **(5 x 2 = 10)**

(a) Significance of modulation Index

(b) Power Spectral Density (PSD)

(c) Shot and partition Noise

(d) Equivalent noise resistance and noise figure

(e) Production and detection of Amplitude Modulated Wave

(f) Frequency and phase modulation

Total No. of Pages:2

Roll No. 2K17/EP/024

FOURTH SEMESTER

B.Tech. [ENGINEERING PHYSICS]

END SEMESTER EXAMINATION

May- 2019

EP-202: CONDENSED MATTER PHYSICS

Time: 3:00 Hours

Max. Marks: 40

Note: Answer *ANY FIVE* questions

Assume suitable missing data, if any.

---

1. Explain the following: [3+3+2=8]

(a) Bond dissociation energy of NaCl

(b) Important features of Miller indices and Draw (110) plane

(c) Wiedemann-Franz law

2(a). Explain Edge dislocation and significance of Burger's vector [4]

(b). Aluminum is an FCC crystal with lattice constant 4.05 Å and the number of electrons per unit volume is 1.8064×10^{29} /m^3. Calculate Fermi energy in eV and also evaluate the probability of finding an electron at 300 K for an energy value 0.1 eV higher than E_F. (given that $K_B = 1.381 \times 10^{-23}$ J/K and 1 joule = 6.24×10^{18} eV) [4]

3(a). What do you understand degenerate and non-degenerate states. Prove that in case of a free particle enclosed in infinite potential well energy is quantized and it cannot vary continuously. [4]

(b). Explain d.c. and a.c. Josephson's effects and their importance. [4]

4(a). How do entropy and specific heat vary with temperature for a superconductor. Explain with suitable diagrams. [4]

(b). Define dielectric loss. Show that the dielectric loss is given by imaginary component of dielectric constant. What will be the range of frequency for a dielectric material if it responds to electronic polarization? [4]

5(a). Explain domain/ Bloch wall. Discuss the process and steps of Bloch wall theory and electrostriction methods to use as magnetic storage media. [4]

(b). Derive an expression for paramagnetic susceptibility using Curie – Weiss theory. Why Langevin's classical theory of paramagnetic material was failed? [4]

6(a). Estimate the order of the diamagnetic susceptibility of copper. Use a value of 0.1 nm as the radius and assume that only one electron per atom contributes. Given a = 0.3608 nm for copper. [4]

(b). Explain ionic polarization under AC field. Derive expression for ionic polarization, dipole moment and polarizability under AC field. [4]

Total No. of Pages:3 *Roll No. EP/24*

FOURTH SEMESTER **B.Tech.(EP)**

END SEMESTER EXAMINATION ***(May.-2019)***

EP 204- OPTICS

Time: 3 Hours ***Max. Marks: 40***

Note: Answer any eight questions.

1. (a) In the Newton's rings arrangement, if the incident light consists of two wavelengths 4000 A^0 and 4002 A^0 calculate the distance (from the point of contact)at which the rings will disappear. Assume that the radius of curvature of the curved surface is 400 cm.

   If the lens is slowly moved upwards, calculate the height of the lens at which the fringe system (around the center) will disappear.

   (b) A particular laser is operating in single mode and emitting a continous wave lasing emission whose spectral width is 1 MHz. What is the coherence time and coherence length?

   [3, 2]

2. (a) Consider a Gaussian beam propagating along the z direction whose amplitude distribution on the plane z = 0 is given by

$$A(\xi, \eta, 0) = A\, exp[\frac{-\xi^2 + \eta^2}{{w_0}^2}]$$

   Obtain the expression for the intensity of the propagating beam.

   (b) A Gaussian beam is coming out of a laser. Assume λ = 600 nm and that at z =0, the beam width is 1mm and the phase front is plane. After traversing 10m through vacuum what will be (i) beam width and (ii) the radius of curvature of the phase front.

   [3,2]

3. Consider a plane wave incident normally on a circular aperture of radius a. Calculate the corresponding Fraunhoffer diffraction. [5]

4. (a) Plane waves of monochromatic light (600 nm) light are incident on an aperture. A detector is situated on axis at a distance of 20 cm from the aperture plane.

(i) What is the value of R_1, the radius of the first Fresnel half period zone, relative to the detector?

(ii) If the aperture is a circle of radius 1cm, centered on axis, how many half period zones does it contain?

(iii) If the aperture is a zone plate with every other zone blocked out and with radius of the first zone equal to R_1 (found in (i)), determine the first three focal lengths of the zone plate.

(b) Compare the diffraction patterns due to a single slit and a double slit. [3,2]

5. (a) Consider a plane wave of wavelength 6×10^{-5} cm incident normally on a circular aperture of radius 0.01 cm. Calculate the position of the brightest and the darkest points on the axis.

What would happen if the circular aperture is replaced by a circular disc of the same radius?

(b) A Fabry Perot interferometer is to be used to resolve the mode structure of a He- Ne laser operating at 632.8 nm. The frequency separation between the modes is 150 MHz. The plates are separated by an air gap and have a reflectance (r^2) of 0.999.

(i) What is the coefficient of finesse of the instrument?

(ii) What is the resolving power required?

[3,2]

6. Explain the working of the CO_2 laser, with the help of the suitable diagram indicating the various vibrational levels taking part in the transition. [5]

7. Explain Cornu's spiral. Analyze the Fresnel diffraction at a straight edge using Cornu's spiral. Also sketch the intensity pattern. [5]

8. Analyze using Fresnel integrals the diffraction of a plane wave incident normally on a long narrow slit. Further analyze the transition of Fresnel diffraction to Fraunhoffer diffraction. [5]

9. Consider a straight edge being illuminated by parallel beam of light with wavelength 0.6 μm. Calculate the positions of the first two maxima and minima on a screen at a distance of 50 cm from the edge. Also, find the corresponding values of intensity (I/I_0). [5]

Table for Fresnel integrals is given below

FRESNEL INTEGRALS

s	$C(s)$	$S(s)$
0.0	0.000	0.000
0.2	0.200	0.004
0.4	0.398	0.033
0.6	0.581	0.111
0.8	0.723	0.249
1.0	0.780	0.438
1.2	0.715	0.623
1.4	0.543	0.714
1.6	0.366	0.638
1.8	0.334	0.451
2.0	0.488	0.343
2.5	0.457	0.619
3.0	0.606	0.496
3.5	0.533	0.415
4.0	0.498	0.420
∞	0.500	0.500

2K17/EP/014

Total No. of Page 02 *Roll No. .....*

FOURTH SEMESTER **B.Tech. (EP)**

END SEMESTER EXAMINATION *May-2019*

EP206: Microprocessor and Interfacing

Time: 3:00 Hours ***Max. Marks : 40***

Note : Ques.1 is compulsory. Attempt 4 questions in all. All questions carry equal marks. Assume suitable missing data, if any.

Q.1. Design and analyze the functional block diagram of Programmable interval Timer-8253, thereby explaining the various blocks and the various modes of operation of this peripheral IC. [10]

Q.2. (a) Design and program an interfacing circuit to read data from an A/D converter using 8255.

(i.) Set up Port A to read data.

(ii.) Set up bit PC2 to start conversion and bit PC7 to read the ready status of the converter. [5]

(b) Write an assembly language program in 8086 to find the largest number in a set of ten numbers located at an address of 1000:1001 onwards. [5]

Q.3. (a) Consider that the interrupt vector 47 is in progress. Evaluate the ISR address for a hardware interrupt vector type 47. Determine the addressing modes of the following instructions:

i. JMP [5]
ii. LEA SI, [1200]
iii. MOV CX, [BX+DI+4] [5]

(b) Signify the roles of Address Register, Terminal Count Register and Status Register in context with the Direct Memory Access Controller. Differentiate between the AND and TEST instructions in 8086. [5]

P.T.O

Q.4.(a) With the help of an example, describe the action performed by microprocessor 8086 for the following instructions:
(i) AAD, (ii) SCASB, (iii) IMUL, (iv) ROR and (v) XLAT [5]

(b) What should be the status of the pins QS1 and QS0 of 8086 that indicates the queue is empty and no operation is being performed respectively? Suppose that DS=1200H, BX=0100H and SI=0250H. Determine the address accessed by the following instruction, assuming real mode operation:

MOV [100H], DL [5]

Q.5 (a) The contents of CS and IP in 8086 are 4500H and 5600H. Obtain the 20-bit effective/physical address to be used in the address bus for accessing the specified location. The contents of memory location $F0000_{16}$ are FF_{16}, $F0001_{16}$ are 00_{16} and at $F0002_{16}$ are 11_{16} What is the even-addressed data word stored at an address $F0000_{16}$ and the odd addressed data word stored at an address $F0001_{16}$. [5]

(b) Describe the use of CAS0, CAS1 and CAS2 lines in a system with a cascaded 8259's. Give the significance of Special Mask Mode in Priority Interrupt Controller. [5]

END

Total No. of Pages: 2

2K17/EP/24

Roll No. .....

FOURTH SEMESTER **B.Tech. (EP)**

END SEMESTER EXAMINATION **(*May-2019*)**

EP-208 COMPUTATIONAL METHODS (NEW SCHEME)

Time: 3 Hours ***Max. Marks: 50***

Note : Answer any five questions.
Assume suitable missing data, if any.

1. (a) What are the various sources of errors? Explain the same by taking an example pendulum motion. **[5]**

   (b) Derive the formula of double integration by Simpson's one-third method. Divide the x limits into 4 and y limits into 2 parts. **[5]**

2. (a) Solve for a positive root of $x^3 - 3x - 5 = 0$ between 2 and 3 using three approximation of Regula falsi method. **[5]**

   (b) Define all the difference operators. Express all of them in terms of shifting operator **[5]**

3. (a) If $y_0 = 3, y_1 = 12, y_2 = 81, y_3 = 200, y_4 = a$ and $y_5 = 8$, find y_4 using the given data. **[5]**

   (b) Define first and second divided difference. Derive Newton's divided difference formula for unequally spaced data points. **[5]**

4. (a) Derive Newton cote's formula and deduce Simpson's one-third method. **[5]**

(b) Evaluate the double integral: $I = \int_{y=0}^{1}\int_{x=0}^{1} e^{x+y}dxdy$ using Trapezoidal rule. Divide the x- and y range in four equal intervals. **[5]**

5. (a) Use Taylor's series method to find the value of y at $x = 0.1$ and 0.3 for the equation $\frac{dy}{dx} = x^2 - y$. Given that $y(0)=1$ **[5]**

(b) Apply fourth order Runge-Kutta Method to find approximate value of y at $x = 0.1$ by taking $h = 0.1$; if $\frac{d^2y}{dx^2} = y^3$, given that $y(0) = 10$ and $y'(0) = 5$. **[5]**

6. Write Matlab code for any two of the following numerical methods **[10]**

(a) Root by bisection method

(b)Solution of 1st order differential equation by Euler's Method

(c) Integration by Bool's method.