Total No. of Pages 02

Roll No. EP/024

FOURTH SEMESTER

B.Tech. (EP)

MID SEMESTER EXAMINATION

March-2019

EC-272 COMMUNICATION SYSTEM

Time: 1.5 Hours

Max. Marks: 30

Note: Answer ALL questions.

Assume suitable missing data, if any.

Q1: i) What are the important elements of communication system? Explain the steps and structure involved in the process of electronic communication? Show the details of below mentioned frequency band for various communication systems and mention the type of communication respectively:

Very Low Frequency, Low Frequency, Medium Frequency, High Frequency, Ultra High Frequency, Super High Frequency **(04)**

ii) What is modulation? Explain the three reasons for the necessity of modulation in wireless transmission? Explain the difference between linear and non-linear modulation? **(03)**

iii) What are the reasons of errors in communication system? Define noise. Where it is most likely to affect the signal? What does modulation actually do to a message and carrier? **(03)**

Q2: i) Mention in the detail the important components of typical network for wireless broadcasting, transmission and reception? **(04)**

ii) What is signal? Explain the difference between continuous and discrete time signals along with real and complex signals. **(03)**

Q3: i) What are various types of modulations? Explain the difference among them? Give short notes on Flicker, Recombination and Solar Noises **(04)**

ii) Discuss any **THREE** from the following: **(3 x 3 = 09)**

(a) Bandwidth requirement

(b) Periodic and non-periodic signals

(c) Optical fibre Communication and limitations

(d) Limitations of wireless communications

Total No. of Pages: 1

Roll No. EP/024

FOURTH SEMESTER

B.Tech. [ENGINEERING PHYSICS]

MID SEMESTER EXAMINATION

(March- 2019)

EP-202: CONDENSED MATTER PHYSICS

Time: 1:30 Hours

Max. Marks: 30

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

1.(a). What are Cooper pairs? Describe formation of cooper pair in superconductor. [3]

(b). How does the energy gap in superconductors differ from the energy gap in insulators? How does it vary with temperature for superconductors? [3]

2. (a). The penetration depth of Sn at absolute zero is 3.4×10^{-6} cm. Find the value of penetration depth and super electron density at 3.5 K. Transition temperature of Sn is 3.72 K. [3]

(b). Define superconductivity? Explain the phenomenon behind the process of magnetic levitation and Maglev vehicles. [3]

3.(a). An atom of polarizability, α is placed in a homogeneous field E. Show that the stored energy stored in a polarized atom is equal to $E^2(\alpha/2)$. [3]

(b). Find the polarizability of CO_2, if the susceptibility is 0.985×10^{-3}. Density of carbon dioxide is 1.977 kg/m^2. [3]

4. What is Lorentz field? Show that the Lorentz field for 3-dimentional elemental solid is given by; $\mathbf{E_L} = \mathbf{E} + \frac{\gamma \mathbf{P}}{\varepsilon_0}$, Where E_L, E, γ and P are Lorentz filed, external field, internal field coefficient and polarization. [6]

5. *Explain:* (a) Isotope effect in superconductors [1.5×4=6]

(b) Type-II superconductor (c) Dielectric constant in ac field.

(d) Draw frequency vs polarizability (real and imaginary component) plot for all polarization and show the individual frequency range.

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

Fourth semester B.Tech. [Engg. Physics]

MID SEMESTER EXAMINATION (March 2019)

EP-204 OPTICS

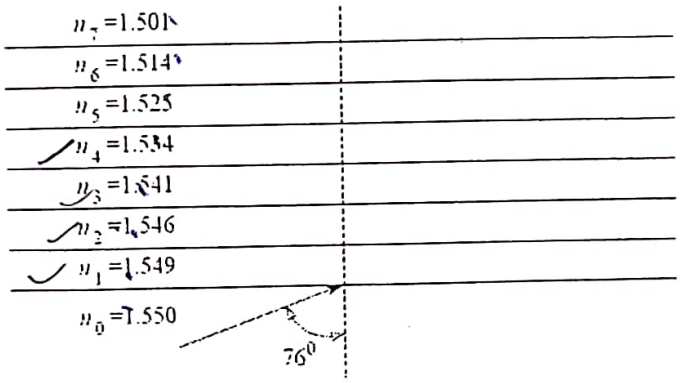
Time : 1:30 hours **Max. Marks: 30**

Answer all questions

1. (a) It is not possible to show interference effects between light from two separate sodium vapour lamps but you can show interference effects between sounds from loudspeakers that are driven by separate oscillators. Explain why it is so.

(b) Draw a neat diagram showing the optical arrangement of a Michelson interferometer.

(c) A light ray is incident on a dielectric stack of refractive indexes as shown below at angle 76° with respect to the normal. What is the exit angle of the ray?

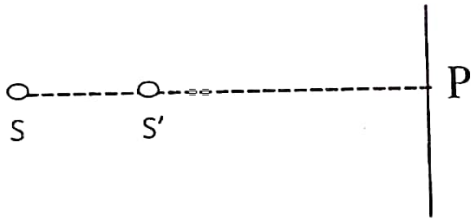


(d) Two light filters are used to transmit yellow light centered around 590 nm. One filter has a broad transmission width of 100 nm, whereas the other has a narrow pass band of 10 nm. Which filter would be better to use for an interference experiment? Compare the coherence lengths of the light from each.

(e) Plot the function 'Sin^2 Nγ/ Sin^2 γ' for N =5.

(f) A grating with 200 lines per millimetre and of width 2cm is fully illuminated by light consisting of wavelengths 600 nm and 600.1 nm. What is the lowest diffraction order where two wavelengths will be resolved?

(g) A pair of point sources , S, S' emitting a wavelength of 500nm with a spectral width of 500nm with a spectral width $\Delta\lambda$, and separated by distance of 1mm are placed as shown in figure. What is the condition on $\Delta\lambda$ so that one can observe an interference pattern around the point P, given that the screen is placed at a distance of 1 m from the midpoint of the sources?



[2*7 =14]

2. In Newton's rings experiment, light containing two wavelengths λ_1 an λ_2 are used. The radius of the plano convex lens used is R. If the nth dark ring due to λ_1 coincides with the (n+1) th dark ring due to λ_2, prove that the radius of the nth dark ring of λ is

$$\sqrt{\left(\frac{\lambda_1\lambda_2 R}{\lambda_1-\lambda_2}\right)}$$ [4]

3. A Fabry Perot interferometer has a 1cm spacing between mirrors and a reflection coefficient of r = 0.95. For a wavelength around 500nm, determine its mode number, its figure of merit, its minimum resolvable wavelength interval and its resolving power. [4]

4. Assume a Gaussian pulse of the form

$$\psi(x = 0, t) = E_0 \, exp\,(-\frac{t^2}{2\tau^2}) e^{i\omega_0 t}$$

Find the fourier transform A(ω). Show that the temporal coherence is ~ τ. Assume $\tau >> (1/\omega_0)$, plot the Fourier transform A(ω) [as function of ω] and interpret it physically. Show that the frequency spread $\Delta\omega \sim 1/\tau$.

Following standard integral can be used:

$$\int_{-\infty}^{\infty} \exp[-\alpha x^2 + \beta x]\, dx = \sqrt{\frac{\pi}{\alpha}} \exp\left(\frac{\beta^2}{4\alpha}\right); \quad \alpha > 0$$

[4]

5. Consider a plane wave incident normally on a rectangular aperture of width b (along the ξ axis) and width a (along the η axis) placed on the aperture plane. For such a case,

$$U(\xi, \eta, 0) = A \qquad |\xi| < b/2 \quad \text{and} \quad |\eta| < a/2$$
$$= 0 \qquad \text{else where}$$

for all values of η. Calculate the corresponding Fraunhofer diffraction pattern.

[4]

Total no. of pages: 02 Roll No. EP/24

FOURTH SEMESTER **B. Tech. [EP]**

MID SEMESTER EXAMINATION **March - 2019**

EP206: Microprocessors and Interfacing

Time: 1.5 Hours **Max. Marks: 30**

Note : *All questions are compulsory.*

Ques.1. Briefly explain the timing diagram of I/O Read Bus Cycle in 8086 indicating the status of all relevant bus signals. 3

Ques.2. Determine the status of flag bits in the Flag Register after execution of the following instruction sequence:

```
MOV AL, OABH
MOV BL, O11H
SUB AL, BL
MOV AH, AL
SAHF
```

3

Ques.3. Distinguish between the real mode addressing and the protected mode addressing in 16-bit and higher order Pentium processors. By what frequency does the 8284 clock generator divide the crystal oscillator's output frequency? 4

Ques.4. Discuss the role of HLDA, READY, BHE and NMI signals in 8086 microprocessor. 4

Ques.5. How single stepping can be done in 8086? In 8086, if the offset address is 6789H and segment address is 3456H, obtain the corresponding physical address. 4

Ques.6. Explain the following instructions in 8086:

(i) CMC
(ii) LES SI, [5000]
(iii) SAR AX, 03H
(iv) DAS

4

P.T.O.

Ques.7. Develop a sequence of instructions that searches through a block of 100H bytes of memory. This program must count all the unsigned numbers that are above 42H and all that are below 42H. Byte sized data segment memory location UP must contain the count of numbers above 42H and the data segment memory location DOWN must contain the count of numbers below 42H. 4

Ques.8. Identify the addressing modes used in each of the following 8086 instructions:

(i) ADD AL, [BX+SI+04]
(ii) MOV AL, 0004H
(iii) MOV AX, [DX]
(iv) JMP AX 4

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EP/24

Total No. of Page: 1

Roll No. .....

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

MID SEMESTER EXAMINATION **(*March-2019*)**

EP-208 COMPUTATIONAL METHODS

Time: 1.5 Hours ***Max. Marks: 25***

Note : Attempt all questions.
Assume suitable missing data, if any.

1. Derive the general formula to find out the maximum permissible error. If $F = \frac{xy^3}{z^2}$, find the maximum possible error in F at $x = 1$, $y = 2$, $z = 4$, given that $dx = 0.1$, $dy = 0.01$ and $dz = 0.1$. **[5]**

2. Graphically explain the process of finding the root by Regula-Falsi and Secant method. Use Newton-Raphson method to find out the real root of $x \log_{10} x = 1.2$ using three iterations. Use $x_0 = 2$ as initial condition for solving the equation. **[5]**

3. Show that **[5]**

   (i) $\mu\delta = \frac{\Delta E^{-1}}{2} + \frac{\Delta}{2}$

   (ii) $\Delta^3 y_2 = \nabla^3 y_5$

4. Using Newton's Finite Divided Difference Method, calculate the value of the function at $x = 2.75$. **[5]**

x	2.5	3.0	4.5	4.75	6.0	7.0
$f(x)$	8.85	11.45	20.66	22.85	38.6	55.6

5. Write down the difference table and mark the elements used in the Bessel's formula of interpolation. Use these elements with their respective coefficient to deduce the Bessel's formula. **[5]**

********** **END** **********