NATIONAL INSTITUTE OF TECHNOLOGY, PATNA

Mid Sem Exam, March 2025

Program: B.Tech/B.Tech+M.Tech. (ECE)   Semester: 2nd   Department: APME

Course Code: PH25101   Course Name: Engineering Physics

Full Marks: 30   Duration of Examination: 2 Hours

Attempt all questions :(Symbols have their usual meanings)

Q.1 The electric field vector $\vec{E}$ of a plane electromagnetic wave in a medium   [3+4+3]

is given in SI units as

$$\vec{E} = 10\sin(0.003x - 840000t)\hat{z}$$

Find the following properties of the medium

  (a) Find the average radiation pressure of the EM wave
  (b) Dielectric constant and Refractive Index of the medium
  (c) Impedance offered by the medium

(handwritten annotations): $\vec{E_0}$, $B = \frac{E_0}{C}$, $(CO-2)$, $\langle \frac{1}{2} uc \rangle$, $\frac{1}{2}\epsilon_0 E^2 c$, ϵ_r, μ, $\frac{u}{c}$ w, $\frac{Es^2}{m^2 s^{-1} m}$, $\epsilon_r = \frac{\epsilon}{\epsilon_0} = 1 + \chi_e$, $\frac{E}{H} = \sqrt{\frac{\mu_0}{\epsilon_1}}$, $E = \mu HC$, $\frac{E}{H} = \mu C$, $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$

Q.2 Check the divergence theorem for the function   [10]

$$\vec{A} = r^2 \cos\theta\, \hat{r} + r^2 \cos\phi\, \hat{\theta} - r^2 \cos\theta \sin\phi\, \hat{\phi}$$

for a partial volume of unit sphere bounded by limits

$$\theta : 0 \to \pi/2 \,\&\, \phi : 0 \to \pi$$

Note: Expression for divergence

$$\nabla\cdot\vec{A} = \frac{1}{r^2}\frac{\partial}{\partial r}(r^2 A_r) + \frac{1}{r\sin\theta}\frac{\partial}{\partial\theta}(\sin\theta A_\theta) + \frac{1}{r\sin\theta}\frac{\partial A_\phi}{\partial\phi}$$

(handwritten annotations): $[CO-1]$, $\frac{E}{H} =$, $E = BC$, $\frac{E}{H} = \mu C$, $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$, $\sqrt{\frac{\mu_0}{\mu_0 \epsilon_0}}$, $\vec{v} = \vec{E} \times \vec{B}$, $\vec{k} = \vec{E}\vec{B}$, $k = \frac{2\pi}{\lambda}$

Q.3 At the interface between one linear dielectric (ε_1) and another (ε_2), the   [10]

electric field lines bend. In the first medium, electric Field E_1 impinges at $[CO-1]$

angle θ_1 from the normal at boundary, and emerges as E_2 into the other

medium at an angle θ_2 from the normal. Find out the ratio of $\left(\dfrac{\tan\theta_2}{\tan\theta_1}\right)$,

assuming no free charges at the boundary.

Program: B. Tech   Semester: 2nd
Department: HSS

Course Code: HS25101
Branch: ELECTRONICS AND COMMUNICATION ENGINEERING (ECE A & B)
Course Name: Communicative English
Full Marks: 22.5   Duration of Examination: 2 Hours

Instructions:
Answer all questions.
Marks for each question has been allotted separately.

1. Describe the process of communication and explain its importance in personal and professional settings. Discuss the different levels of communication and how they impact the flow of information.
(2.5 marks)

2. Construct a paragraph using a mix of simple, compound, and complex sentences to describe a recent event or experience.
(2 marks)

3. Identify and correct the subject-verb concord errors in the following sentences:
(1.5 marks)

   a. "The team are going to the meeting."
   b. "Each of the students have their own laptop."
   c. "The news was that the company are hiring new staff."

4. Convert the following sentences from active to passive voice and vice versa:
(2 marks)

   a. "The manager wrote the report."
   b. "The new policy was implemented by the board."

5. Convert the following direct speech into indirect speech:
(2 marks)

   a. "I will meet you at 5 PM," said John.
   b. "She said, 'I am going to the store.'"

6. Correct the punctuation errors in the following sentences:
(1.5 marks)

a. Lets eat grandma
b. The colors of the rainbow are red orange yellow green blue indigo and violet

7. Identify and explain four key traits of a good listener. (2 marks)

8. What are plosives? Give examples to support your answer. (1.5 marks)

9. Discuss some strategies to improve self-confidence in speaking English. Explain how practice, feedback, and recording can help in improving speaking skill. (1.5 marks)

10. Answer the following questions in about 250 words each.   (3+3)
   a. Discuss the barriers to effective communication and suggest strategies to overcome them.

   b. Explain the significance of listening skills in communication and describe the traits of a good listener.

NATIONAL INSTITUTE OF TECHNOLOGY, PATNA
Mid Sem Exam, September 2024 (Sem-1)

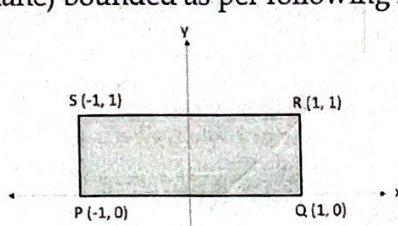Program: B.Tech/B.Tech+M.Tech. (ME/Mechatronics) Department: Physics

Course Code: PH12101/111101 Course Name: Engineering Physics

Full Marks: 30 Duration of Examination: 2 Hours

Attempt any of the three questions :(Symbols have their usual meanings)

Q.1	Find the gradient and the Laplacian of the following scalar functions (ϕ). (a) $\phi = \frac{1}{\|\vec{r}-\vec{r'}\|}$ (Assume r is variable and r' is constant.) (b) $\phi = \ln r$	[10]
Q. 2	State the Gauss' divergence theorem. Also, verify the Gauss' divergence theorem for $\vec{A} = (y - z + 2)\hat{\imath} + (yz + 4)\hat{\jmath} - xz\hat{k}$ taken over the region bounded by surface of the cube x = 0, y = 0, z = 0, x = 2, y = 2, z = 2.	[10]
Q.3	(a) Show that the vector field $\vec{A} = \frac{-x\hat{\imath}-y\hat{\jmath}}{\sqrt{x^2+y^2}}$ is a "sink" field.	[3]
	(b) If a rigid body rotates about an axis passing through the origin with angular velocity $\vec{\omega}$ and with linear velocity $\vec{v} = \vec{\omega} \times \vec{r}$, then prove that $\vec{\omega} = \frac{1}{2}(\nabla \times \vec{v})$	[04]
	(c) If $\vec{A} = \frac{\vec{r}}{r}$, find grad div$\vec{A}$; where $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$ $\nabla(\nabla \cdot \vec{A})$	[03]
Q 4	State and verify the stoke's theorem for $\vec{A} = (x^2 + y^2)\hat{\imath} - 2xy\hat{\jmath}$, over the surface of the region (on the XY-plane) bounded as per following figure 	[10]

$\oint \vec{v} \cdot \vec{A}$

Name and Roll Number: Max. marks: 30

All questions are compulsory and carry equal marks. Assume suitable data if needed.

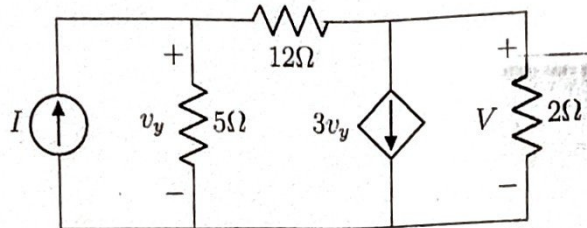1. Find V/I for the circuit shown in Fig. 1.   (CO:1, BL:3)

Figure 1: Circuit Diagram for Q.No.1

2. Apply a suitable approach to determine the load resistance R_L such that the maximum power transferred to the load.   (CO:1, BL:3)
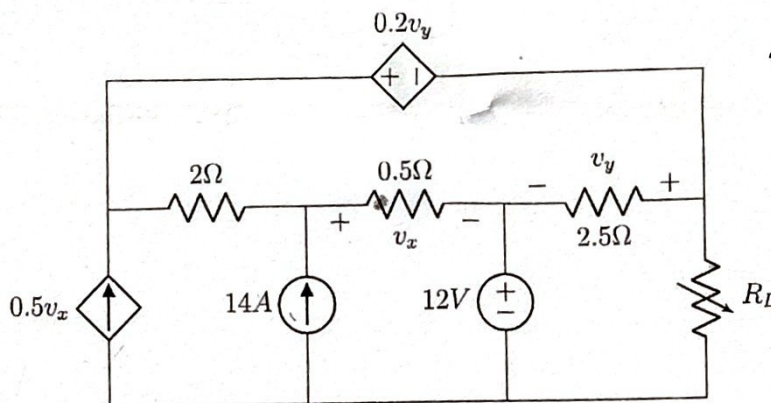

Figure 2: Circuit Diagram for Q.No.2

3. For the equivalent delta-star loads (shown in Fig. 3), develop mathematical relations for R_A, R_B and R_C in terms of R_{AB}, R_{BC} and R_{CA}.   (CO:1, BL:2)
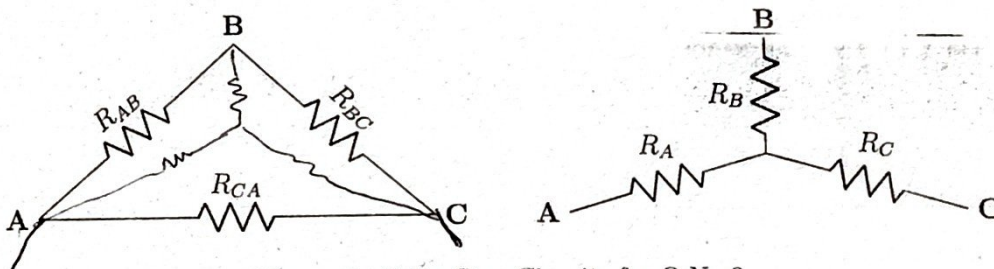

Figure 3: Delta-Star Circuits for Q.No.3

$Req = \left(R_{AB} + R_{BC}\right) \| R_{CA}.$

4. Determine the resonance frequency of the circuit given in Fig.4. Draw the resonance phasor diagram, displaying all voltages and currents. What will be the circuit's equivalent resistance? (CO:2, BL:3)
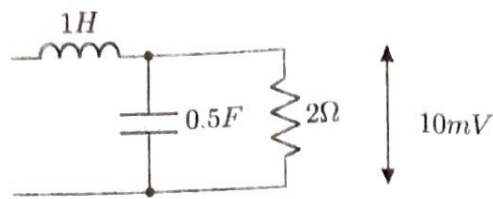

Figure 4: Circuit Diagram for Q.No. 4

5. Evaluate the voltage (across), current (through), and power (real or reactive) of each element shown in Fig. 5. Also, draw the complete phasor diagram by indicating various voltages, currents and their corresponding angles. (CO:3, BL:3)
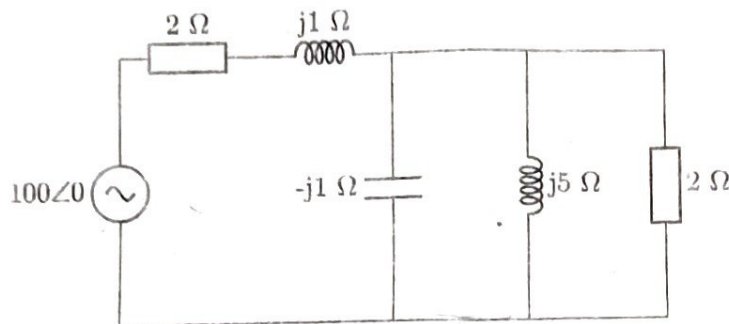

Figure 5: Circuit Diagram for Q. No.5

6. For the circuit shown in Fig.6, evaluate the instantaneous current through **RC branch**. Also, evaluate the average power for this particular branch. (CO:3, BL:4)
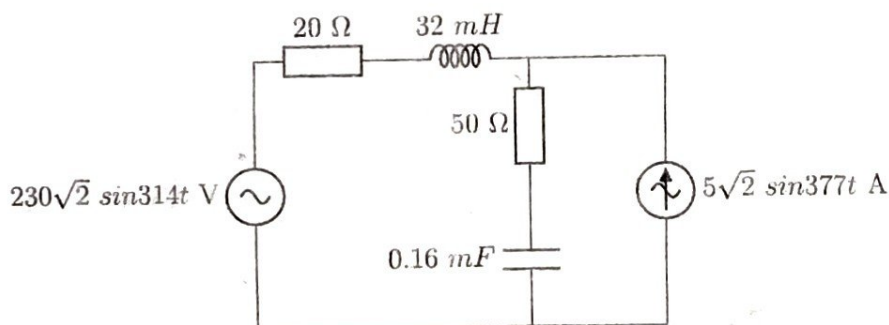

Figure 6: Circuit Diagram for Q. No.6

B.Tech.- ECE: Semester 2
Course Name: Fundamental of Communication Engineering   **Course Code: EC25102**
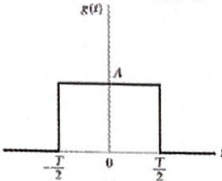**Maximum Time: 2 hours**   **Max. Marks: 30**

Instruction:

1. Attempt all questions.
2. Assume any suitable data, if necessary.
3. The Marks, CO (Course Outcome), and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

		Marks	CO	BL
1	Transform the following time-domain signal $g(t)$ in the frequency domain. $g(t)$ A $-\frac{T}{2}$ $\quad$ 0 $\quad$ $\frac{T}{2}$ $\quad$ t **OR** Find the Fourier transform of (i) unit impulse function, $\delta(t)$ and (ii) unit step function, $u(t)$.	5	CO1,	U, R,
2	Explain the Shannon capacity formula. An ideal power-limited communication channel with additive white Gaussian noise has 4 kHz bandwidth and a signal-to-noise ratio of 255. Determine the channel capacity. $\quad$ ⑧. $\quad S_{/2} = 255$ $\quad 32 \times 10^3$ dBw	5	CO1, CO4	A
3	An AM signal is given by $S_{AM}(t) = A_c \cos \omega_c t + 2 \cos \omega_c t \cos \omega_m t$. What will be the minimum value of A_c for proper envelope detection?	5	CO1, CO4	A
4	What do you understand by the modulation? What is the need of modulation in the communication system? Draw the waveforms of message signal, carrier signal and amplitude modulated signal, in both time and frequency domain.	5	CO1	R
5	Show the generic block diagram of an Analog and Digital communication system. Explain each block in detail.	5	CO1	R
6	A sinusoidal message signal of $4\sin(4\pi \times 10^3 t)$ is transmitted through 8-level PCM system with a sampling rate five times the Nyquist rate. Find step size, sampling rate, maximum quantization error, bit rate, bit duration, and transmission bandwidth. **OR** Let an angle-modulated signal is represented as: $x_{Angle}(t) = 100 \cos[2\pi f_c t + 4\sin 2000\pi t]$, where, $f_c = 10$ MHz. Determine (i) average transmitted power, (ii) peak-phase deviation, (iii) peak frequency deviation, and (iv) Is this an FM or PM signal or both? Explain.	5	CO1	R

*************************End of Question Paper*************************

MID SEMESTER EXAMINATION, Jan-Jun 2025

Program: B.Tech (2nd semester) /B. Tech-M.Tech-DD-ECE (2nd Semester)
(E.C.E.)

Course Name: Computer Hardware and Networking

Course Code: CS25102

Duration of Exam: 2 hours

Max Marks: 30

Instructions:
1. Attempt all questions.
2. Assume any suitable data, if necessary. *(Any other instruction need to provide by the concern faculty)*
3. The marks, Course Outcome (CO) and Bloom's Level (BL) related to questions are mentioned on the right-hand side margin.

		Marks	CO	BL
1	With a suitable block diagram explain the functional units of a computer systems.	2	CO1	Understnding computer hardware
2	Differentiate between Von Neumann and Non-Von Neumann computer architectures. (Or) Explain the architectures of computer system based on Flynn's classification.	3	CO1	Understnding computer architecture
3	(i) Write short note on BIOS. (ii) Differentiate between a dual-core processor and a quad-core processor.	3+2	CO1	Understnding computer architecture
4	What do you mean by RAM and ROM? Explain the types of ROM.	2+4	CO1	Understnding computer memory
5	A 3.5-inch floppy disk drive uses two-sided disks and records data on 80 tracks per side. A track has nine sectors and each holds 512 bytes of data. The disk rotates at 360 rpm, the seek time is 10 msec track to track, and the head settling time is 10 msec. From the above information calculate the following. (a) The total capacity of the floppy disk in bytes. (b) The average rotational latency. (c) The time taken to read a single sector once it has been located. (d) The average rate at which data is moved from the disk to the processor during the reading of a sector. This should be expressed in bits per second. (e) The packing density of the disk in terms of bits per inch around a track located at 3 inches from the center.	5	CO1	Analysing computer memory
6	(i) Define operating system and state its functions. (ii) What do you mean by a Multi-Tasking OS (also state few names of Multi-Tasking OS)? What is the major drawback of a Multi-Tasking OS?	3+3	CO2	Understnding operating system
7	Differentiate between Linux and Windows NT. (Or) With a suitable block diagram explain the components of a data communication system.	3	CO2	Understnding operating system and networking