



**NATIONAL INSTITUTE OF TECHNOLOGY PATNA**  
**END SEMESTER EXAMINATION, JAN-JUNE 2024**

Program: UG & DD

Semester: 2<sup>nd</sup>

Department: HSS

Course Code: HS25101

Branch: ECE- I & II

Course Name: Communicative English

Full Marks: 45

Duration of Examination: 3 hours

Note: Answer any 3 questions. Each question carries equal marks. (i.e. 15 marks)

1. Write a précis of the following passage and put a suitable title to it:

The NEP 2020 is founded on the five guiding pillars of Access, Equity, Quality, Affordability and Accountability. It will prepare our youth to meet the diverse national and global challenges of the present and the future. In school education, the National Education Policy 2020 stresses on the core values and principle that education must develop not only the cognitive skills, that is, - both 'foundational skills' of literacy and numeracy and 'higher-order' skills such as critical thinking and problem solving - but also, social and emotional skills - also referred to as 'soft skills' - including cultural awareness and empathy, perseverance and grit, teamwork, leadership, communication, among others. The Policy aims and aspires to universalize the pre-primary education and provides special emphasis on the attainment of foundational literacy/numeracy in primary school and beyond for all by 2025. It recommends plethora of reforms at all levels of school education which seek to ensure quality of schools, transformation of the curriculum including pedagogy with 5+3+3+4 design covering children in the age group 3-18 years, reform in the current exams and assessment system, strengthening of teacher training, and restructuring the education regulatory framework. It seeks to increase public investment in education, strengthen the use of technology and increase focus on vocational and adult education, among others. It recommends that the curriculum load in each subject should be reduced to its 'core essential' content by making space for holistic, discussion and analysis-based learning.

2. As students union leader of NIT Patna, you have been asked to draft a Memo to addressing the freshers and all the other students about the resolutions taken at the recent Students' Meet. Include the given points in the memo as highlights of the Meet:

\*Anti-Ragging steps

\*Gender Equality steps

\*Placement issues

3. Assume that you are the Manager of Sales department of a reputed firm which conducted a workshop to enhance marketing skills of the sales executive. Write a Report to the Director Sales discussing the purpose and outcome of the workshop.
4. Following position of Quality Assurance Manager is vacant at our Manufacturing unit at JBM Group, Raurkela. Applicants should be B. Tech graduates, preferably with an experience of 3 to 5 years in an engineering Organisation. Strong analytical and trouble shooting skills are required along with exposure to updated technologies. Write a Cover Letter and Resume applying for the same.
5. What is Communication? Discuss types and channels of communication

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**NATIONAL INSTITUTE OF TECHNOLOGY PATNA**  
**END SEMESTER EXAMINATION Jan-June 2024**

SUBJECT: Computer Hardware and Networking  
 SUBJECT CODE: CS25102  
 SECTION: B.Tech.-ECE / B.Tech.-M.Tech.-DD-ECE-MV

DURATION: 3 Hrs.  
 FULL MARKS: 60  
 SEMESTER: SECOND

Attempt all questions

		Marks	CO	BL
Q1.	a) What are the different types of computer? b) Explain the concept of track and sector of the hard-disk drive. c) What is Intranet, Extranet, and Internet? d) Explain Peer-to-Peer and Client-Server Network.	[2x4]	CO1 & CO3	Understand
Q2.	Differentiate the following: a) Short-term, medium-term, and long-term process scheduler. b) User datagram protocol, and transmission control protocol. c) Multiprogramming and multitasking operating system.	[2x3]	CO2	Understand
Q3.	Explain the following protocols: a) FTP and TFTP b) HTTP and HTTPS c) SMTP and POP3 d) ARP and RARP e) MIME and IMAP f) DHCP and DNS	[2x6]	CO3	Understand & remember
Q4.	a) Explain each layers of OSI model in detail. b) How OSI model differ from TCP/IP model? <i>→ 1 point left</i>	[7] [3]	CO3	Understand
Q5.	a) Explain different types of network security. b) Explain functions, advantages, and applications of Firewall, Gateways, and Transceivers.	[5] [3]	CO3 & CO4	Understand
Q6.	a) Explain different classes of IPv4. What is classless inter-domain routing (CIDR) protocol? b) Calculate the <b>subnet mask, First Host IP, and Last Host IP</b> for each block. Suppose in an organization have four different blocks: IT block (136 hosts), Admin Block (95 Hosts), Academic Block (51 Hosts), and Science Block (24 hosts). Consider the IP address of Original Network: <b>192.168.1.0/24</b> . Draw the complete network with proper utilization of IP addresses, subnet masks, and network devices.	[4+2] [8+2]	CO3	Understand & Apply

16  
128  
64  
32  
178  
1-26  
1-2

136  
95  
51  
24  
306  
12

Savg =  $\frac{EH}{2}$

$B = \frac{E}{V}$

$2.5 \times 10^8$



**NATIONAL INSTITUTE OF TECHNOLOGY, PATNA**  
**End SEMESTER EXAMINATION- May 2024**  
**SESSION: 2023-24, Semester 2**

Program: B. Tech. and B Tech Dual Degree (ECE)

Course Code: PH25101

Full Marks: 60

Department: Physics

Course Name: Engineering Physics

Duration of Examination: 3 hours

Note: (i) Answer any 4 of the given questions only.

(ii) Do not attempt Extra Questions in any case.

1. (a) Two parallel plates of capacitor having equal and opposite charges are separated by 8.0 mm thick dielectric material of dielectric constant 3.8. If the electric field strength inside is  $10^6$  V/m, determine the polarization vector, displacement vector and energy density in the dielectric.

(b) Describe electrostatic boundary conditions for displacement vector (**D**) across two dielectric media.

[10+5]

2. Derive the Intensity Expression for Single slit Fraunhofer Diffraction and the conditions of Maxima and Minima.

[15]

3. The electric field vector  $\vec{E}$  of a plane electromagnetic wave in a medium is given in SI units as

$$\vec{E} = 10 \sin(750000t - 0.003x) \hat{z}$$

Find the following properties of the medium

(a) Average Intensity of the EM wave

(b) Dielectric Constant of the Medium.

[10+5]

4. X-rays of wavelength 10.0 pm are Compton Scattered from electrons of a target, Find

(a) the maximum possible scattered wavelength.

(b) the maximum possible Kinetic Energy of the recoiled electron.

[10+5]

5. Describe in detail, the principle of Ruby Laser with Schematic diagram of components and Energy levels.

[15]

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**NATIONAL INSTITUTE OF TECHNOLOGY, PATNA**  
Department of Electronics and Communication Engineering

END SEMESTER EXAMINATION, MAY 2024

**For B. Tech. (ECE) – 2<sup>nd</sup> Semester**

Course Code: **EC25102**  
Full Marks: **60**

Course Name: **Fundamentals of Communication Engineering**  
Duration of Examination: **3 Hours**

- Instructions:
1. Answer all the questions.
  2. The marks corresponding to each of the Questions have been mentioned.
  3. Read the questions very carefully before you start answering them.
  4. Assume any suitable date, if necessary.

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Q. No.	Questions																																																																																																																																																																				
1.a.	Describe the brief history of Communication Engineering. Give your answer in pointwise/Tabular manner.	[4]	1																																																																																																																																																																		
1.b.	With the help of necessary diagrams/expressions/tables, distinguish between Analog and Digital Communication systems.	[6]	1																																																																																																																																																																		
2.a.	Find the Fourier Transform of: $x(t) = \delta(t)$ ; and hence, obtain the Fourier Transform of $y(t) = x(t) + (3 * e^{-3 t })$ .	[6]	2																																																																																																																																																																		
2.b.	What do you understand by Sampling Theorem? Explain the principle of pulse-code modulation (PCM). Describe briefly the three major steps of PCM.	[4.5]	3																																																																																																																																																																		
2.c.	With the help of necessary diagrams/expressions, describe the principle behind PAM, PPM, and PWM. Also, discuss their respective methods for generations.	[4.5]	3																																																																																																																																																																		
<b>OR</b>																																																																																																																																																																					
3.a.	With the help of necessary diagrams/expressions, describe the working principle of envelope detector. Also mention the relation between frequency and time-constant.  Consider the carrier and the message signal, which are expressed respectively as: $c(t) = 10 \cos(2\pi f_c t)$ and $m(t) = \cos(20\pi t)$ . Assume that this particular message signal ( $m(t)$ ) is utilized to frequency modulate the above carrier signal ( $c(t)$ ), with $k_f = 50 \text{ Hz/V}$ . Determine (i) the expression for the modulated signal, and (ii) also, determine how many harmonics should be selected to contain 99% of the modulated signal power? Use the table of Bessel Function values, as provided below.	[5]	4																																																																																																																																																																		
<table border="1"> <thead> <tr> <th><math>n</math></th> <th><math>\beta = 0.1</math></th> <th><math>\beta = 0.2</math></th> <th><math>\beta = 0.5</math></th> <th><math>\beta = 1</math></th> <th><math>\beta = 2</math></th> <th><math>\beta = 5</math></th> <th><math>\beta = 8</math></th> <th><math>\beta = 10</math></th> </tr> </thead> <tbody> <tr><td>0</td><td>0.997</td><td>0.990</td><td>0.938</td><td>0.765</td><td>0.224</td><td>-0.178</td><td>0.172</td><td>-0.246</td></tr> <tr><td>1</td><td>0.050</td><td>0.100</td><td>0.242</td><td>0.440</td><td>0.577</td><td>-0.328</td><td>0.235</td><td>0.043</td></tr> <tr><td>2</td><td>0.001</td><td>0.005</td><td>0.031</td><td>0.115</td><td>0.353</td><td>0.047</td><td>-0.113</td><td>0.255</td></tr> <tr><td>3</td><td></td><td></td><td></td><td>0.020</td><td>0.129</td><td>0.365</td><td>-0.291</td><td>0.058</td></tr> <tr><td>4</td><td></td><td></td><td></td><td>0.002</td><td>0.034</td><td>0.391</td><td>-0.105</td><td>-0.220</td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td>0.007</td><td>0.261</td><td>0.186</td><td>-0.234</td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td>0.001</td><td>0.131</td><td>0.338</td><td>-0.014</td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td>0.053</td><td>0.321</td><td>0.217</td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td>0.018</td><td>0.223</td><td>0.318</td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td>0.006</td><td>0.126</td><td>0.292</td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td>0.001</td><td>0.061</td><td>0.207</td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.026</td><td>0.123</td></tr> <tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.010</td><td>0.063</td></tr> <tr><td>13</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.003</td><td>0.029</td></tr> <tr><td>14</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.001</td><td>0.012</td></tr> <tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.004</td></tr> <tr><td>16</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.001</td></tr> </tbody> </table> <p style="text-align: center;"><b>Table of Bessel function values</b></p>				$n$	$\beta = 0.1$	$\beta = 0.2$	$\beta = 0.5$	$\beta = 1$	$\beta = 2$	$\beta = 5$	$\beta = 8$	$\beta = 10$	0	0.997	0.990	0.938	0.765	0.224	-0.178	0.172	-0.246	1	0.050	0.100	0.242	0.440	0.577	-0.328	0.235	0.043	2	0.001	0.005	0.031	0.115	0.353	0.047	-0.113	0.255	3				0.020	0.129	0.365	-0.291	0.058	4				0.002	0.034	0.391	-0.105	-0.220	5					0.007	0.261	0.186	-0.234	6					0.001	0.131	0.338	-0.014	7						0.053	0.321	0.217	8						0.018	0.223	0.318	9						0.006	0.126	0.292	10						0.001	0.061	0.207	11							0.026	0.123	12							0.010	0.063	13							0.003	0.029	14							0.001	0.012	15								0.004	16								0.001
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3.b.	Using the suitable Tabular-format, describe the different generations of Wireless Communications (in terms of access technology, data rate, frequency band, bandwidth, applications, etc.).  <b>OR</b> With the help of suitable example and block diagram, explain the process of indirect method of wideband FM signal generation.	[5]	5
3.c.	What are the major features/services of GSM? Draw and explain briefly the GSM architecture.  <b>OR</b> Discuss the advantages and disadvantages of wired and wireless communication systems.	[5]	5
4.a.	Estimate the maximum core diameter for an optical fiber, having rel. refractive index diff. ( $\Delta$ ) = 1.5%, core refractive index ( $n_1$ ) = 1.48, and which may be suitable for <i>single-mode operation</i> . Here, it can be assumed that this fiber is operated at the wavelength of 850 nm. Further, estimate the new value of maximum core diameter ( $2a$ ) for the single-mode operation when the relative refractive index difference is reduced by a factor of 10.	[5]	5
4.b.	Considering a multimode step-index optical fiber, having $NA = 0.31$ , and core refractive index ( $n_1$ ) = 1.456. Let the material dispersion parameter, $M = 255 \text{ ps/nm/km}$ , which makes material dispersion the totally dominating intra-modal dispersion mechanism. Find the value of total rms pulse broadening per kilometer. Let's assume that this optical fiber is used with an LED source of rms spectral width of 49 nm.  <b>OR</b> With the help of necessary block diagram, explain the working principle of optical fiber systems. Also, provide the broad classification of optical fibers, and explain their performances.	[5]	5
5.	What is IOT? Using the necessary diagrams, explain briefly about the IOT Ecosystem and its major components?  Suggest some (possible) self-manageable IOT applications, that can be used in different domains of our day-to-day life.  Describe briefly the different sensors for IOT applications.  <b>OR</b> With the help of suitable diagram/expressions, write the short notes on the following: (a) Types of AM schemes (b) FM demodulation method (c) Concept of Cellular system (d) Dirichlet conditions for Fourier Transform	[4 + 2.5 + 3.5 = 10]  <b>OR</b> [2.5 × 4 = 10]	7       2,4,5

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- - - x X x - - - End-of-Question-Paper - - - x X x - - -

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# NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Department of Electronics Engineering

END SEMESTER EXAMINATION, Jan-June 2024

B. Tech: Semester-II

Course Name: Elements of Electrical Engineering

Course code: EE25101

Maximum time: 3 hours

Maximum marks: 60

Course outcome (CO) and Bloom's level (BL) for various questions:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
CO	CO1	CO1	CO1	CO2	CO3	CO2	CO2	CO4	CO5
BL	A3	A3	A3	A3	A3	A3	A3	A3	R1

## Instructions:

1. Questions on both side of page
2. Attempt all questions.
3. Assume any suitable data, if necessary.

1. (6 points) Derive an expression for the voltage gain  $v_0/v_s$ , and evaluate its magnitude for the case  $R_s = 5 \text{ k}\Omega$ ,  $r_\pi = 2.5 \text{ k}\Omega$ ,  $g_m = 40 \text{ mA/V}$ ,  $r_0 = 100 \text{ k}\Omega$  and  $R_L = 5 \text{ k}\Omega$ . What would the gain value be if the effect of  $r_0$  were neglected? (Refer: Fig Q1)

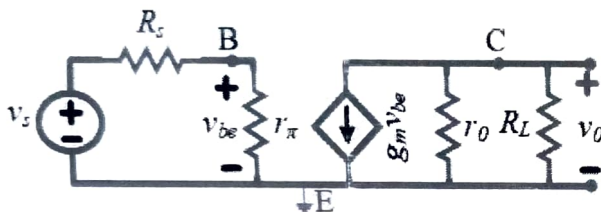


Fig Q1

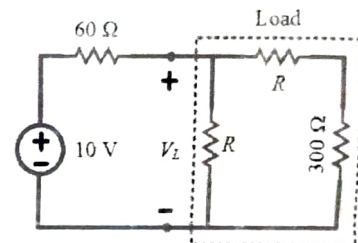


Fig Q2

2. (6 points) Compute (i) the value of  $R$  that leads to maximum power transfer to the load, (ii) the voltage across the load, and (iii) the power absorbed by the load. (Refer: Fig Q2)
3. (5 points) The linear circuit of Fig Q3 is found experimentally to have the voltage and current relationship shown. Find its Norton's equivalent. (Refer: Fig Q3)

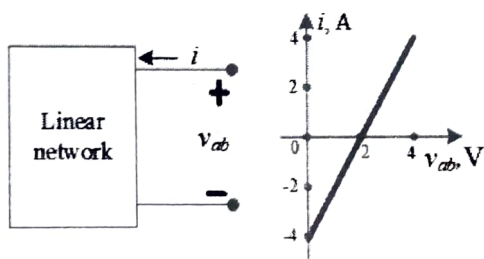


Fig Q3

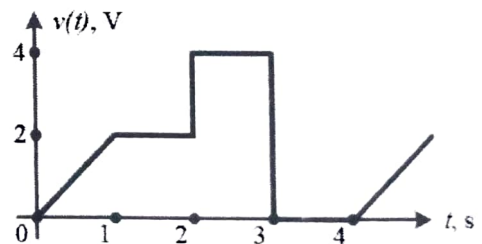


Fig Q4

4. (5 points) Compute the effective value, average value and the form factor for the given periodic signal. (Refer: Fig Q4)
5. (10 points) Consider the  $3\phi$ , Y-Y configuration with the following parameters:  
 Source voltage:  $\bar{V}_{SA} = 120\angle 0^\circ \text{ V (rms)}$   
 Source impedance:  $Z_g = 0.05 + j0.15 \Omega$   
 Load impedance:  $Z_L = 4 + j3 \Omega$   
 Feeder impedance:  $Z_f = 0.1 + j0.2 \Omega$



- (a) (2 points) Draw the 3- $\phi$  layout for the above circuit and show the different components.
- (b) (2 points) Compute  $\bar{I}_A$  and  $\bar{V}_{AN}$ .
- (c) (2 points) Without further analysis, state the value of  $\bar{I}_B$ ,  $\bar{I}_C$ ,  $\bar{V}_{BN}$ ,  $\bar{V}_{CN}$ .
- (d) (2 points) Find the line-to-line voltages  $\bar{V}_{AB}$ ,  $\bar{V}_{BC}$ ,  $\bar{V}_{CA}$ .
- (e) (2 points) Find the total average power delivered to the loads.

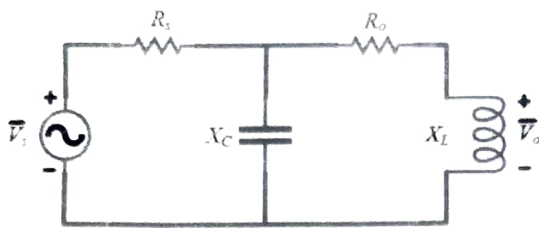


Fig Q5

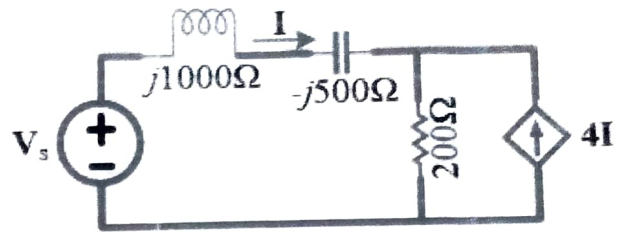


Fig Q6

6. (6 points) Draw the approximate phasor diagram for the circuit. Take  $\bar{V}_o$  as reference phasor and  $R_s = R_o = X_C = X_L = 1\Omega$ . (Refer: Fig Q5)
7. (6 points) Consider the circuit Fig Q6, where  $V_s = 120$  V rms. (Refer: Fig Q6)
  - (a) (2 points) Find the average power (in watts) absorbed by the resistor.
  - (b) (4 points) Find the average power delivered by each source.
8. (10 points) The symmetric magnetic circuit of Figure 1 has three windings. Winding 1 has  $N_1 = 400$  turns. Winding A and B each have  $N = 300$  turns and are wound on the two bottom legs of the core. The core dimensions are indicated in the figure:  $l_A = 48\text{cm}$ ,  $l_1 = 10\text{cm}$ ,  $l_2 = 5.8\text{cm}$ ,  $g = 0.2\text{cm}$ ,  $A_c = 36\text{cm}^2$ , and  $\mu_r = 1650$ . Assume  $I_1 = 0.5$  A,  $I_A = I_B = 1$  A. (Refer: Fig Q8)
  - (a) (3 points) Find the reluctance of each section.
  - (b) (2 points) Draw the equivalent circuit of the magnetic circuit.
  - (c) (5 points) Find the flux in each branch of the equivalent circuit.

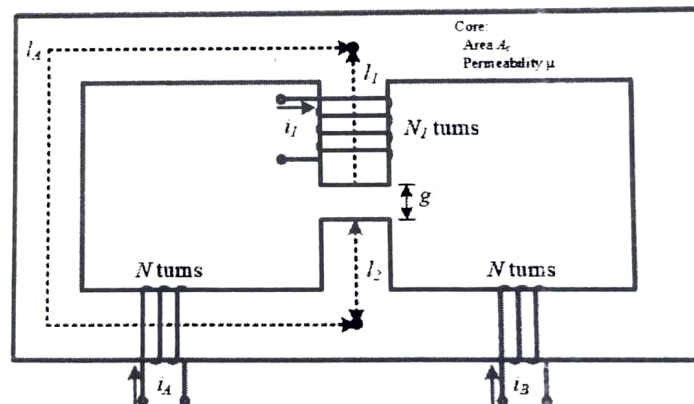


Fig Q8

9. (6 points) Define the following terms in relation to an instrument:
  - (a) (1 point) Accuracy
  - (b) (1 point) Resolution
  - (c) (1 point) Precision
  - (d) (1 point) Expected value
  - (e) (1 point) Error
  - (f) (1 point) Sensitivity