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NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)
First Semester B.Tech. (CBCS) Degree Examinations
December 2022
HU1001-1 – TECHNICAL ENGLISH

Duration: 3 Hours

Max. Marks:100

Note:
Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.
Part – B: Descriptive Answer type Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I** & **Unit – II each** and **One full** question from **Unit – III**.

PART - A: MULTIPLE CHOICE QUESTIONS
20 Marks

1. They want to <u>a</u>sk the teacher about the assignment. Identify the Short Vowel sound for the underlined letters.
A) /ɑ:/
B) /i:/
C) /ɜ:/
D) /ɔ:/

2. I ch<u>ea</u>ted the officials about the transaction. Identify the Short Vowel sound for the underlined letters.
A) /ɑ:/
B) /i:/
C) /ɜ:/
D) /ɔ:/

3. Why don't you offer him a s<u>ea</u>t?
A) /ɑ:/
B) /i:/
C) /ɔ:/
D) /u:/

4. The Taj Mahal is one of the wond<u>e</u>rs of the world.
A) /ɪ/
B) /ə/
C) /ʌ/
D) /e/

5. Identify the British accent for 'Laboratory'.
A) /ləbɒrətrɪ/ -
B) /læbɒrətrɪ/
C) /læbərətrɪ/
D) /ləbɒrɪtrɪ/

6. 'On the birth of a child'. Use an appropriate response to the occasion.
A) Happy Birthday
B) Welcome to the world
C) Congratulations
D) All the best

7. Identify the highest degree of politeness.
A) Can you...
B) Could you...
C) Do you mind...
D) Do you mind... Please...

8. Gestures can be seen in _____ communication.
A) Indirect
B) Spoken
C) Written
D) Telephonic

9. Effective communication involves using appropriate voice and _____ language.
A) good
B) English
C) proper
D) body

10. Identify the problem of Telephone communication.
A) Absence of Body Language
B) No facial expression
C) Dependent on voice
D) All of these

11. The chief guest concluded his Speech _____ stressing on Buddha's teachings of the importance of charity.
A) By
B) With
C) At
D) In

12. The teacher found many mistakes in my paper when she went _____ it.
A) Into
B) About
C) For
D) Through

13. _____ oranges I brought are sour.
A) A
B) The
C) An
D) No article

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14. He _____ to Kerala last week.
   A) Will go
   B) Went
   C) Going
   D) Goes

15. Correct the sentence: "I shall see the brakes whether they work well."
   A) I shall see the brakes whether they working well.
   B) I shall see whether the brakes working well
   C) I shall see whether the brakes work well.
   D) I shall see the brakes if they are working well

16. What does R.K.Narayan imply when he writes, "But for headache there would be many embarrassments in life."
   A) Headache creates embarrassments
   B) Headache helps to escape from unpalatable s
   C) Embarrassments in life create headache
   D) Headache and embarrassments are normal in

17. Fast foods are delicious _____ usually unhealthy people should avoid them.
   A) But
   B) However
   C) So
   D) They

18. According to Ambedkar _____ are the best examples for parliaments.
   A) Buddhist Bhikshu Sanghas
   B) British governments
   C) Res Judicata
   D) Indians

19. In the poem 'Telephone Conversation', repeated mention to the red colour stands for
   A) Terror and disturbance
   B) Peace and love
   C) Red-cross
   D) Charity

20. The car looked good; _____ the price was right.
   A) Moreover
   B) And
   C) Since
   D) But

PART - B: DESCRIPTIVE ANSWER QUESTIONS
Unit – I

			Marks	BT*	CO
1.	a)	Transcribe the words into IPA and Mark the Primary Stress (i - v) and transcribe the words in IPA into English (vi - x). i) Know ii) Foot iii) Uncle iv) Educate v) Democracy vi) /naɪt/ vii) /bʊk/ viii) /ˈriːdə/ ix) /pʊə/ x) /ˈjuːnjən/			
	b)	List out the normal weak forms and strong forms of Auxiliary words.	4	L3	1
	c)	Define the term Communication. Elaborate the different modes of communication.	4	L1	1
	d)	The person the caller wants to speak to is unavailable. What would you tell the caller in eachcase? i) The person is speaking on his phone ii) The person is busy at the moment iii) The person is on leave iv) The person is not available right now.	4	L2	2
2.	a)	Transcribe the plural forms of words (i - v) and past tense forms of words (vi - x) into IPA. i) Bat ii) Keep iii) Month iv) Dog v) Brush vi) Laugh vii) Amaze viii) Try ix) Hunt x) Reach	4	L2	2
	b)	Explain Word Stress. State any four rules to substantiate.	4	L3	1
	c)	What do you mean by Telephone Etiquette? List out a few common Telephone Etiquette.	4	L1	1
	d)	List out a few useful phrases in: i) Introducing oneself ii) Introducing others iii) When meeting for the first time being introduced iv) Responding to a greeting	4	L2	2
3.	a)	Transcribe the words into IPA and Mark the Primary Stress (i - v) and transcribe the words in IPA into English (vi - x). i) Bought ii) Teacher iii) Gain iv) Race v) Field vi) /ˈdʒækɪt/ vii) /ɜːn/ viii) /riːd/ ix)/ˈfaɪə/ x) /ˈkʌntri/	4	L1	2
			4	L3	1

b) Discuss the challenges in discriminating certain pairs of sounds in the English language with examples.   4   L1   1   12

c) Discuss the most common expression for requests. Give a formal and informal situation and response for a request to pass a glass of water.   4   L2   2   9,11

d) How is a telephonic message organized? What are the items of information that should be included in the message? Give two details for leaving messages.   4   L1   2   9,11

Unit – II

a) Read the following passage and answer the questions that follow:

Amit Tyagi begins his day early. There are meetings lined up for the day with his 12-member core group that includes a five-member design team, the business development manager and the chief financial officer. The evening is to be spent with his sponsor and business associate, discussing the expansion of his business venture to Japan and Indonesia. At 32, Tyagi is the CEO of Tyagi Design Pvt. Ltd., and also, one of the leading fashion designers.

Fast realizing that the business is not just selling stuff at weddings and fashion shows, designers are corporatizing haute couture. Among the first is Geeth Kumar, with her 25-year-old son Ashish giving the necessary push to move her designer retail chain Geeth's, into top gear last year. Ashish who is the Director (marketing) of his mother's enterprise, Gitika Designs Pvt. Ltd., got Mumbai based Universal Consulting to evaluate the scope of the company and revamp its retailing system. Now Geeth can sit anywhere in the world and keep a tab on the stages of processing and sale of garments. Says Ashish, "Quantifying this change is difficult, but our production of sales and finished goods to sales ratio are improving every month".

Designers are turning over a new leaf, hiring professionals for design, business development, marketing and advertising to keep time and cost overruns in check. The payoff is starting to show. Karuna Mehta's business has grown almost by 65 percent. She discusses sales reports, budget and marketing strategies with her 40-member team regularly. Her team feeds the schedule and details on each collection onto a PC – earlier maintained in Mehta's head and a notebook. And she doesn't juggle all the decisions, instead alternates between her labels G2 and Abe and spends the rest of the time on her couture business and meeting clients. "I find it refreshing to be only responsible for my creations, not to think of which magazine to advertise in or what schemes to run in my stores. It's all taken care of."

     i) One of the recent trends in the Indian fashion industry is the emergence of _____

     ii) What is the name of Geeth Kumar's enterprise?

     iii) Why has Karuna Mehta's business grown by 65 percent?

     iv) G2 and Abe are labels by _____

     v) Where is Ashish Tyagi planning for business expansion?

     vi) Find the synonym of the word "dressmaking" from the passage.

     vii) Find a suitable title for the passage.

     viii) Find the antonym of the word "limitations" from the passage.   8   L3   3   1, 4, 7, 8, 10,12

b) According to Dr Ambedkar, treachery and infidelity of Indians caused challenges to the independence of the country. Explain.   4   L2   4   2, 5, 11

c) The poem, *The Coromandel Fishers*, is a reflection of a long-established harmony and synergy between humans and nature. Do you think that technology today has destroyed that harmony?   4   L4   4   2, 5, 11

5. a) **Rewrite as directed**

   i) *Add appropriate preposition*
   This course provides the opportunity to focus _____ your major area of interest.

   ii) *Fill in the blanks using the right form of the words given in the brackets.*
   Angie is quite _____ (tolerate) of the screaming of her children.
   Money is _____ (second). Family comes first.

   iii) *Fill in the blanks with either the Present Simple or the Present Continuous form of the verb given in brackets.*
   Kavya _____ her house every Sunday. Today is Sunday. She _____ her house. (clean)

   iv) *Fill in the blanks using the appropriate form of the verbs (past tense) given in brackets.*
   Anil and Sunil _____ cricket in the club yesterday. (play)
   Robin Hood was a character who _____ (steal) from the rich and gave to the poor.

   v) *Fill in the blanks with suitable article*
   Where are _____ Canary Islands?   8   L4   3

   b) Discuss the element of humour in R. K. Narayan's *The Headache*.   4   L4   4

   c) Describe how the feelings of the caller change at different points in the poem *Telephone Conversation*.   4   L2   4

6. a) You are the president of the college student's union. Prepare a welcome address for the college day.   8   L2   3

   b) Write an application for the following advertisement.
   Post: Senior Software Developer
   Qualification: B.E./ M.Tech. in any field of engineering
   Additional Requirements: Minimum 3 years' experience in software development
   Apply to: HR Manager, Alpha Technology Park, New Delhi.   8   L3   4

Unit – III

7. a) **Write a paragraph on the following:** How technology effects my life.   5   L3   5

   b) **Refute the following statement:** Driving age should be 21 because so many kids get into road accidents.   5   L4   5

   c) **Fill in the blanks with appropriate Linkers**
   [and, which, because, as a result, moreover, but]
   In the summer, the rumor of a famine swept through the province _____ was a baseless one _____ the crops were actually growing well _____ the weather was perfect for a bumper harvest. _____ on the strength of that rumor, thousands of small farmers abandoned their farms and fled to the cities. _____ of this, crops failed, thousands starved _____ the rumor about the famine proved true.   6   L2   5

8. a) **Write a paragraph on the following:** Democracy in India.   5   L4   5

   b) **Refute the following statement:**
   Education is too commercialized nowadays   5   L4   5

   c) **Combine the sentences using the linkers given below**
   (so that, nor, so, in spite of, because, despite)
   They wanted to relax. They went to the country in the weekend.
   It was too cold inside, so she turned on the heater.
   He has good computer skills. He wasn't considered for the job.
   Alan and his sister don't enjoy rock music.
   If you'd given me the money, I'd have done the shopping.
   She was ill. She went to work   6   L2   5

Γ* *Bloom's Taxonomy, L* Level;*   CO* Course Outcome; PO* Program Outcome
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NMAM INSTITUTE OF TECHNOLOGY,
Off-Campus Centre of Nitte (Deemed to be University)
First Semester B.Tech. (CBCS) Degree Examinations
December 2022
MA1002-1 – CALCULUS AND DIFFERENTIAL EQUATIONS
(Common to AI&ML/CCE/CSE/ISE/AI&DS)

Max. Marks:100

Duration: 3 Hours

Note:
Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.
Part – B: Descriptive Answer type Questions: Answer **Five full** questions choosing **Two full questions** from **Unit – I & Unit – II each** and **One full** question from **Unit – III.**

20 Marks

PART - A: MULTIPLE CHOICE QUESTIONS

1. The angle ϕ between the radius vector and tangent for the vector for the curve $r = ae^{\theta cot\alpha}$ is
   A) $\tan\alpha$
   B) $\cot\alpha$
   C) α
   D) θ

2. The radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis is
   A) $2\sqrt{2}$
   B) $\sqrt{2}$
   C) 2
   D) $\sqrt{2}/2$

3. The function $f(x) = x^2$ satisfy the Rolle's theorem in which of the following intervals
   A) $[1, 2]$
   B) $[0, 1]$
   C) $[-1, 1]$
   D) none of these

4. The derivative of arc $\frac{ds}{dy}$ for the curve $x = f(y)$ is

   A) $\sqrt{1 + (\frac{dy}{dx})^2}$
   B) $1 + (\frac{dy}{dx})^2$

   C) $1 + (\frac{dx}{dy})^2$
   D) $\sqrt{1 + (\frac{dx}{dy})^2}$

5. If $f(x,y,z) = x^2 + xyz + z$, then the value of f_x at (1,1,1) is
   A) 0
   B) 1
   C) 3
   D) -1

6. If $z = 3x^2y + 5y$ then $\frac{\partial^2 z}{\partial x \partial y}$ is
   A) $3xy$
   B) $6x$
   C) $3x + 5$
   D) $6xy$

7. Which of the following is correct?
   A) $\frac{\partial}{\partial x}(tan^{-1}\frac{y}{x}) = \frac{-y}{x^2+y^2}$
   B) $\frac{\partial}{\partial x}(tan^{-1}\frac{y}{x}) = \frac{x}{x^2+y^2}$
   C) $\frac{\partial}{\partial x}(tan^{-1}\frac{y}{x}) = \frac{x-y}{x^2+y^2}$
   D) $\frac{\partial}{\partial x}(tan^{-1}\frac{y}{x}) = \frac{x+y}{x^2+y^2}$

8. The function $f(x,y) = x^2 + y^2 + 6x - 12$ has an extreme value at which one of the following intervals
   A) $(-3,0)$
   B) $(0,3)$
   C) $(0,0)$
   D) $(-3,-3)$

9. If $\phi = x^3 + y^3 - 2z$ then $\nabla\phi$ at (1, -1, 1) is
   A) $3\hat{i} + 3\hat{j} - 2\hat{k}$
   B) 4
   C) $3\hat{i} + 3\hat{j}$
   D) $\hat{i} + \hat{j} - \hat{k}$

10. $\vec{F}$ is said to be solenoidal if
    A) $\nabla\vec{F} = 0$
    B) $\nabla \cdot \vec{F} = 0$
    C) $\nabla \times \vec{F} = \vec{0}$
    D) $\nabla(\nabla\vec{F}) = 0$

11. If $f(x, y) = 2xy + y^2$ then Hessian of f is

A) $\begin{bmatrix} 2 & 0 \\ 2 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 2 & 0 \\ 2 & 2 \end{bmatrix}$

C) $\begin{bmatrix} 0 & 0 \\ 2 & 2 \end{bmatrix}$

D) $\begin{bmatrix} 0 & 2 \\ 2 & 2 \end{bmatrix}$

12. If $\vec{F} = ax\hat{i} + b\hat{j}$ where a, b are constants, is irrotational, then which of the following is true?

A) $\nabla \times \vec{F} = a$

B) $\nabla \times \vec{F}$ is a scalar quantity

C) $\nabla \times \vec{F} = \vec{0}$

D) $\nabla \times \vec{F} \neq \vec{0}$

13. If two roots of the auxiliary equation of a second order linear differential equation with constant coefficients are real and equal, then the complementary solution is of the form

A) $y_c = Ae^{m_1 x} + Be^{m_2 x}$

B) $y_c = Ae^{mx} + Bxe^{mx}$

C) $y_c = Ae^{mx} + Be^{mx}$

D) $y_c = Ae^m + Bxe^m$

14. Which of the following function is not a solution of the differential equation $y'' + y = 0$?

A) $y = \sin 2x$

B) $y = 2\sin x$

C) $y = \cos x$

D) $y = 15\cos x$

15. The partial differential equation of the expression $z = ax + by$, where a and b are arbitrary constants, is

A) $z = px - qy$

B) $z = p + q$

C) $z = pq$

D) $z = px + qy$

16. Which of the following equation is a parabolic partial differential equation?

A) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

B) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x, y)$

C) $a^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$

D) $\frac{\partial^2 u}{\partial x^2} = 4\frac{\partial^2 u}{\partial t^2}$

17. The value of $\int_0^1 \int_0^2 xy \, dx \, dy =$

A) 0

B) 1

C) 3

D) -3

18. If R is the region bounded by the circles $r = 1$, $r = 2$ and the lines $\theta = 0$ and $\theta = \pi/2$ then $\iint_R r \, dr \, d\theta =$

A) $\int_0^{\pi/2} \int_0^2 r \, dr \, d\theta$

B) $\int_0^{\pi/2} \int_0^1 r \, dr \, d\theta$

C) $\int_0^{\pi/2} \int_1^2 r \, dr \, d\theta$

D) $\int_0^{\pi/2} \int_2^\infty r \, dr \, d\theta$

19. If $\int_0^1 \int_0^2 \int_0^3 ax \, dz \, dy \, dx = \int_0^1 \int_0^2 \int_0^3 by \, dz \, dy \, dx$ then

A) $a = 2b$

B) $b = 2a$

C) $a = b$

D) $a = -b$

20. Which of the following is true?

A) $\Gamma(n+1) = n\Gamma(n)$

B) $\Gamma(n) = n\Gamma(n+1)$

C) $\Gamma(n+1) = (n+1)\Gamma(n)$

D) $\Gamma(n) = (n+1)\Gamma(n+1)$

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I

			Marks	BT*	CO*	PO
1.	a)	State and prove the Cauchy's Mean value theorem.	6	L1	1	1
	b)	A rectangular box open at the top is to have volume of 32cubic ft. Find the dimensions of the box requiring least material for its construction.	6	L2	2	2
	c)	If $x = r\cos\theta$ and $y = r\sin\theta$, find $J = \frac{\partial(x, y)}{\partial(r, \theta)}$	4	L1	2	1
2.	a)	With usual notation prove that $\tan\phi = r\frac{d\theta}{dr}$.	6	L1	1	2
	b)	Obtain the expansion of e^{xy} in powers of $(x-1)$ and $(y-1)$ up to second degree terms.	6	L2	2	2

c) Prove that the curves $r = a\cos\theta$ and $r = a\sin\theta$ intersect orthogonally. | 4 | L2 | 2 | 1

3. a) If ρ_1, ρ_2 be the radii of curvature at the extremities of any chord of the cardioid $r = a(1 + \cos\theta)$ which passes through the pole, show that $\rho_1^2 + \rho_2^2 = 16\,\frac{a^2}{9}$. | 6 | L2 | 1 | 1

b) If $u = f(y - z, z - x, x - y)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. | 6 | L2 | 2 | 2

c) Obtain the Maclaurin's Series expansion of the function $\cos x$. Expand up to three non-vanishing terms. | 4 | L1 | 1 | 1

Unit – II

4. a) If $\phi = x^3 + y^3 + z^3 - 3xyz$, find $\vec{F} = \nabla\phi$. Hence find $\nabla \cdot \vec{F}$ and $\nabla \times \vec{F}$. Evaluate these at the point $(1, -1, 1)$. | 6 | L1 | 3 | 1

b) Solve the differential equation: $(D^3 + D)y = 1 + x^3$ | 6 | L2 | 4 | 1

c) Find the value of b such that
$A = (bx^2 y + yz)\hat{\imath} + (xy^2 - xz^2)\hat{\jmath} + (2xyz - 2x^2y^2)\hat{k}$
is solenoidal. | 4 | L1 | 3 | 2

5. a) Evaluate the gradient and Hessian of the function $f(x,y) = x\sin(y)$ at the point $(1, \pi/2)$. | 6 | L1 | 3 | 1

b) Solve the differential equation: $(D^3 + 6D^2 + 9D)y = e^{-3x} + 2$ | 6 | L2 | 4 | 2

c) Form partial differential equations by eliminating the arbitrary constants/functions:
i) $z = ax^2 + by^2$ ii) $z = f(x^2 + y^2)$ | 4 | L2 | 4 | 1

6. a) Find the directional derivative of $f(x,y,z) = xy^2 + yz^3$ at the point $(2, -1, 1)$ in the direction of $\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$. | 6 | L2 | 3 | 2

b) Solve the P.D.E. by the method of separation of variables:
$u_x = 2u_t + u$ given that $u(x, 0) = 6e^{-3x}$. | 6 | L1 | 4 | 2

c) Find the solution of the differential equation:
$y'' - 3y' + 2y = 0$, given that $y(0) = 0$ & $y'(0) = 1$. | 4 | L1 | 4 | 1

Unit – III

7. a) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dxdy$ by changing to polar co-ordinates. | 6 | L2 | 5 | 1

b) Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ | 6 | L2 | 5 | 2

c) Evaluate in terms of beta function: $\int_0^{\pi/2} \sin^7\theta \cos^5\theta\,d\theta$ | 4 | L1 | 5 | 1

8. a) Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$. | 6 | L1 | 5 | 1

b) Evaluate $\int_0^\infty x^4 e^{-x^2}\,dx$ in terms of Gamma functions. | 6 | L2 | 5 | 2

c) Evaluate the triple integral: $\int_0^1 \int_0^2 \int_1^2 x^2 yz\,dxdydz$. | 4 | L1 | 5 | 2

* Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome
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First Semester B.Tech. (CBCS) Degree Examinations
December 2022
PH1001-1 – ENGINEERING PHYSICS

Max. Marks:100

Duration: 3 Hours

Note:
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List of constants: Velocity of light, $c=3\times10^8 ms^{-1}$, Planck's constant, $h=6.63\times10^{-34}$ Js, Electron mass, $m=9.11\times10^{-31}$kg, Electron charge, $e=1.6\times10^{-19}C$, Boltzmann constant, $k=1.38\times10^{-23}$J/K. Avogadro number, $N_A = 6.022 \times 10^{26}$/ kg mole.

PART - A: MULTIPLE CHOICE QUESTIONS   20 Marks

1. Experimental evidence for matter waves is
   A) photoelectric effect   B) compton effect
   C) electron diffraction   D) interference of light

2. The kinetic energy of electron and proton is the same. The relation between their de-broglie wavelengths λ_e and λ_p is
   A) $\lambda_e = \lambda_p$ B) $\lambda_e < \lambda_p$
   C) $\lambda_e > \lambda_p$ D) $\lambda_e = 2\lambda_p$

3. Schrodinger's time independent equation is applicable for the particles with
   A) constant energy   B) variable energy
   C) only constant potential energy   D) all of these

4. In a one-dimensional infinite potential well, energy of the particle En =
   A) $n^2h^2/8mL^2$ B) $n^2h^2/8mL^2$ $\hbar^2$
   C) $n^2h^2/2mL^2$ D) $n^2h^2/4mL^2$

5. If the atoms or molecules in a solid are periodical at regular intervals of distances in three dimensions, then that solid is known as:
   A) crystalline solid   B) amorphous solid
   C) liquid crystals   D) none of these

6. A cubic crystal system is represented by:
   A) $a = b = c$ $\alpha = \beta = \gamma \neq 90°$ B) $a = b \neq c$ $\alpha = \beta = \gamma = 90°$
   C) $a = b = c$ $\alpha = \beta = \gamma = 90°$ D) $a \neq b \neq c$ $\alpha = \beta = \gamma = 90°$

7. The Miller indices of the plane parallel to the X & Y axes and intersecting Z axis at 1 unit are
   A) (1 0 0)   B) (0 1 0)
   C) (0 0 1)   D) (1 1 0)

8. Wavelength of the X-ray ranges between ... to ...
   A) 0.1Å - 100Å   B) 0.1µm - 100µm
   C) 0.1mm - 100mm   D) 0.1m - 100m

9. A semiconductor is formed by .... bonds.
   A) Covalent   B) Electrovalent
   C) Co-ordinate   D) None of these

10. A semiconductor has .... temperature coefficient of resistance.
    A) Positive   B) Zero
    C) Negative   D) None of these

11. The most commonly used semiconductor is ....
    A) Germanium   B) Silicon
    C) Carbon   D) Sulphur

12. At equilibrium Lorentz force will be _____ to force due to Hall field.
    A) Double   B) Half
    C) Equal   D) Not equal

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13. The magnetic lines of force cannot penetrate the body of a superconductor, phenomenon is known as
    A) Isotopic effect   B) Joule's effect
    C) Meissner effect   D) Silsbee's effect

14. The minimum amount of current passed through the body of superconductor in order destroy the superconductivity is called
    A) Induced current   B) Critical current
    C) Eddy current   D) Hall current

15. A solar cell is a _____
    A) P-type semiconductor   B) N-type semiconductor
    C) Intrinsic semiconductor   D) P-N Junction

16. Difference between a photodiode and a solar cell is
    A) Photodiode works the opposite way a   B) Both are similar whereas photodiode is
    solar cell works   sensor and solar cell is used for power generatio
    C) Photodiodes are always reverse biassed   D) Photodiodes are made of p
    and solar cells are forward biassed.   semiconductors and solar cells are made
                                                compounds.

17. Important characteristic of laser beam is
    A) Interference   B) Diffraction
    C) Dispersion   D) Coherence

18. Emission of a photon by an excited atom due to interaction with a passing photon nearby called
    A) Spontaneous emission   B) Induced absorption
    C) Stimulated emission   D) Thermionic emission

19. Which of the following has more distortion?
    A) Single mode step-index fibre   B) Graded index fibre
    C) Multimode step-index fibre   D) Glass fibre

20. What causes microscopic bend?
    A) Uniform pressure   B) Non-uniform volume
    C) Uniform volume   D) Non-uniform pressure

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I

			Marks	BT*	CO*	PO
1.	a)	Define wavefunction and mention the conditions for a valid wavefunction.	4	L1	1	1,2
	b)	Derive one dimensional time dependent Schrödinger wave equation.	8	L2	1	1,2
	c)	Calculate the de-Broglie wavelength of an electron moving with a velocity of 10^6 m/s.	4	L3	1	1,2
2.	a)	Explain primitive and non-primitive unit cells with appropriate diagrams.	4	L1	2	1,2
	b)	Define coordination number and atomic packing factor. Determine the atomic packing factor for the case of face centered cubic (FCC) lattice by calculating number of atoms/unit cell and obtaining the relation between atomic radius and lattice constant.	8	L2	2	1,2
	c)	The interplanar distance of (110) planes is 2Å for an FCC crystal. Find out the atomic radius.	4	L3	2	1,2
3.	a)	Explain the origin of continuous X-rays with appropriate diagrams.	6	L1	2	1,2
	b)	Derive Bragg's law for X-ray diffraction.	6	L2	2	1,2
	c)	An X-ray machine has an accelerating potential of 35 kV. Find the shortest wavelength produced.	4	L3	2	1,2

Unit – II

a)	Explain the classification of solids based on band theory of solids with appropriate band diagrams.	6	L1	3	1,2
b)	Derive an expression for electrical conductivity of intrinsic semiconductor.	6	L2	3	1,2
c)	Calculate the conductivity of silicon doped with 10^{21} atoms m^{-3} of boron if the mobility of holes is 0.048 $m^2/v.s$.	4	L3	3	1,2

a)	Explain direct and indirect band gap semiconductors with E-k diagrams.	6	L1	3	1,2
b)	Explain the probability of occupation for the energy levels $E<E_F$ and $E>E_F$ at T = 0K.	6	L2	3	1,2
c)	A semiconductor sample of thickness 100 µm is placed in a magnetic field of 0.1T acting perpendicular to its thickness. Find the Hall voltage generated when a current of 100 mA passes through it. Assume the carrier concentration to be 10^{22} m^{-3}.	4	L3	3	1,2

a)	Explain the construction and working of LED with appropriate diagrams.	6	L1	3	1,2
b)	Explain Type-I and Type-II superconductors with appropriate diagrams.	6	L2	4	1,2
c)	A particular green LED emits a light of wavelength 5490 Å. Calculate the band gap of the semiconductor material used in eV.	4	L3	3	1,2

Unit – III

a)	Explain spontaneous emission and stimulated emission with appropriate energy level diagrams.	4	L1	5	1,2
b)	Explain the construction and working of a He-Ne laser with neat appropriate diagrams.	8	L2	5	1,2
c)	The ratio of population of two energy levels is 1.059×10^{-30}. Find the wavelength of light emitted at 300 K.	4	L3	5	1,2

a)	Define numerical aperture. Derive an expression for numerical aperture of optical fibre.	6	L1	5	1,2
b)	Explain step-index single mode and step-index multi mode of optical fibers with appropriate diagrams.	6	L2	5	1,2
c)	The Refractive index of core-cladding materials of step index fibre is 1.48 and 1.45 respectively. Calculate (i) critical angle at the core-cladding interface and (ii) Fractional refractive index change.	4	L3	5	1,2

Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome
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Max. Marks:100

Duration: 3 Hours

Note:

Part – A: Multiple Choice Questions: Answer all Twenty questions in the OMR Sheet provided. Each question carries equal marks.

Part – B: Descriptive Answer type Questions: Answer Five full questions choosing Two full questions from Unit – I & Unit – II each and One full question from Unit – III.

20 Marks

PART - A: MULTIPLE CHOICE QUESTIONS

Notebook PCs fall into a category of devices called
A) mobile computers
B) desktop computers
C) hybrid computers
D) tabulators

The binary system uses powers of
A) 3
B) 2
C) 10
D) 8

A computer program that converts assembly language to machine language is
A) Compiler
B) Interpreter
C) Assembler
D) Comparator

C was developed by
A) Dennis Ritchie
B) Devid Ritchie
C) John Ritchie
D) Robert Lafore

An assembly language is a
A) Middle level programming language
B) High level programming language
C) Internet based programming language
D) low level programming language

_____computers are lower to mainframe computers in terms of speed and storage capacity.
A) Mini
B) Super
C) Mainframes
D) Hybrid

A byte consists of
A) One bit
B) Four bits
C) Eight bits
D) Sixteen bits

C Language developed at _____?
A) AT & T's Bell Laboratories
B) IBM
C) Sun Microsystems
D) Cambridge University

What is the output of C Program?
```c
int main()
{
   int k;
   for(;;)
   {
     printf("TESTING\n");
     break;
   }
   return 0;
}
```
A) No Output
B) TESTING
C) Compiler error
D) None of these

0. To print out *a* and *b* given below, which of the following *printf()* statement will you use?
```c
#include<stdio.h>
float a=3.14;
double b=3.14;
```
A) printf("%f %lf", a, b);
B) printf("%Lf %f", a, b);
C) printf("%Lf %Lf", a, b);
D) printf("%f %Lf", a, b);

-1-

11. **What is the way to suddenly come out of or Quit any Loop in C Language.?**
    A) continue; statement   B) break; statement
    C) leave; statement   D) quit; statement

12. **Which of the following is a post test loop?**
    A) if else   B) do while
    C) While   D) for

13. **What is the output of this program?**
    ```
    #include <stdio.h>
    int main()
    {
        int i;
        i = 1, 2, 3;
        printf("%d", i);
        return 0;
    }
    ```
    A) 1   B) 2
    C) 3   D) Invalid Syntax

14. **Choose a right C Statement**
    A) Loops or Repetition block executes a   B) Loop is usually executed as long as a condition
       group of statements repeatedly.   is met
    C) Loops usually take advantage of Loop   D) All of these
       Counter

15. **Which loop is faster in C Language: for, while or Do While?**
    A) for   B) while
    C) do while   D) All work at the same speed

16. **What should be the output?**
    ```
    int main()
    {
        int a = 10/3;
        printf("%d",a);
        return 0;
    }
    ```
    A) 3.33   B) 3.0
    C) 3   D) 0

17. **Which of the following function is appropriate for reading a multi-word string?**
    A) printf()   B) scanf()
    C) gets()   D) puts()

18. **What will strcmp() function do?**
    A) compares the first n characters of the   B) undefined function
       object
    C) copies the string   D) compares the string

19. **What is a String in C Language?**
    A) String is a new Data Type in C   B) String is an array of Characters with null
                                                     character as the last element of array
    C) String is an array of Characters with null D) String is an array of Integers with 0 as the last
       character as the first element of array   element of array

20. **What is the Format specifier used to print a String or Character array in C Printf or Scanf function?**
    A) %c   B) %C
    C) %s   D) %w

PART - B: DESCRIPTIVE ANSWER QUESTIONS

		Marks	BT*	CO*	PO*

Unit – I

		Marks	BT*	CO*	PO*
a)	Outline the basic structure of a C program with a neat diagram and example.	6	L2	1	1
b)	Demonstrate any four Bitwise operators in C with example.	6	L2	2	1
c)	Define flowchart. Illustrate with a neat flowchart to calculate the volume and surface area of a cube. [Volume=s³ and surface area=6s², where s is the side length of a cube]	4	L2	1	1

		Marks	BT*	CO*	PO*
a)	Explain the various steps involved in program development with a neat diagram.	6	L2	1	1
b)	Evaluate the following expressions: i) a+2>b&&!c||a!=d&&a-2<=e where a=11, b=6, c=0, d=7 and e=5 ii)17-8/4*2+3-++a where a=5	6	L5	2	2
c)	Identify the given variables are valid or not. i) int ph_value; ii) int 2005year; iii) float while; iv) int x2;	4	L3	2	1

		Marks	BT*	CO*	PO*
a)	Summarize various classification of digital computers on the basis of their size and capacity to access memory.	6	L2	1	1
b)	Define C tokens and Identifiers with example. Develop a C program to swap two number.	6	L3	2	1
c)	Explain symbolic constants with examples.	4	L2	1	1

Unit – II

		Marks	BT*	CO*	PO*
a)	Explain the unformatted input with example.	8	L2	3	1
b)	Develop a C program to find the largest of 3 number.	4	L3	4	1
c)	Compare and Contrast entry-controlled loop and exit controlled loop.	4	L2	3	1

		Marks	BT*	CO*	PO*
a)	Explain the different types of Function Call with example.	6	L2	5	1
b)	Demonstrate switch statement with syntax, flowchart and example.	6	L2	3	1
c)	Define array. Summarize types of array with example.	4	L2	4	1

		Marks	BT*	CO*	PO*
a)	Explain the various elements of User defined functions with an example.	6	L2	5	1
b)	Write a C program to find the sum of all digits in a given number.	6	L3	4	1
c)	Illustrate continue and go to statement with example.	4	L2	3	1

Unit – III

		Marks	BT*	CO*	PO*
a)	Explain the following with syntax and suitable example. i) Strcmp() ii) Strncpy() iii) Strncat() iv) Strlwr()	8	L2	5	1
b)	Define Structure with syntax. Illustrate Declaration and Accessing the Structured Variable with example.	8	L2	5	1

		Marks	BT*	CO*	PO*
a)	Develop a C program to copy contents of one file to another file.	8	L3	5	1
b)	Develop a C program to read N integers into an array A and find the sum of elements using pointers.	8	L3	5	1

T* Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome
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NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)
First Semester B.Tech. (CBCS) Degree Examinations
December 2022
EC1001-1 – BASIC ELECTRONICS

Duration: 3 Hours

Max. Marks:100

Note:

) *Part – A: Multiple Choice Questions:* Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

) *Part – B: Descriptive Answer type Questions:* Answer **Five full** questions choosing **Two full** questions from **Unit – I** & **Unit – II each** and **One full** question from **Unit – III.**

) Assume missing data suitably.

PART - A: MULTIPLE CHOICE QUESTIONS   20 Marks

The voltage at which forward current through the diode starts increasing rapidly is called as
A) Cut in voltage
B) Breakdown voltage
C) Saturation voltage
D) Cut off voltage

Smaller the ripple factor, the output will have higher components of
A) AC
B) DC
C) spike
D) pulse

The efficiency of half wave rectifier is about
A) 0.46%
B) 1.21%
C) 81.2%
D) 40.6%

In a bipolar junction transistor the collector current is controlled by
A) Collector voltage
B) Collector resistance
C) Base current
D) None of these

If a 2 mV input signal produces a 2V output signal, what is the voltage gain?
A) 1000
B) 0.004
C) 100
D) 0.001

Total emitter current in BJT is
A) $I_C + I_{CBO}$
B) $I_B + I_C$
C) $I_C + I_E$
D) $I_B - I_C$

Which is not a MOSFET terminal?
A) Base
B) Drain
C) Source
D) Gate

JFET is considered as a voltage controlled device because _____.
A) Gate current is controlled by drain voltage
B) Gate current is controlled by source voltage
C) Drain current is controlled by gate voltage
D) Drain current is controlled by source voltage

Which of the following electrical characteristics is not exhibited by an ideal op-amp?
A) Infinite output resistance
B) Infinite bandwidth
C) Infinite voltage gain
D) Infinite slew rate

). An integrator circuit using an Op Amp has .... in its feedback path
A) Resistor
B) Inductor
C) Capacitor
D) Diode

I. The identification 555 for IC 555 timer is mainly because
A) It has voltage levels of 5V in the internal circuitry
B) It has five Op Amp comparators internally
C) It has a series of three $5k\Omega$ resistors in the internal circuitry
D) None of these

2. IC 555 timer operating as a free running oscillator is a
A) DC to AC converter
B) AC to DC converter
C) DC to DC converter
D) DC to DC inverter

13. In Colpitts' oscillator, the components used in the feedback network are
    A) 2L and 1C   B) 2C and 1L
    C) 2R and 2C   D) 2L and 2C

14. With a resistance value of R=1kΩ in a feedback network of RC oscillator, frequency of oscillations generated is 5 kHz. The value of the capacitor C is
    A) 0.129 µF   B) 0.0219 µF
    C) 129 µF   D) 0.0129 µF

15. Gain with negative feedback is given by $A_f = \frac{A}{1+A\beta}$. The closed loop gain is
    A) A_f B) A
    C) β C) None of these

16. An amplifier has an open loop voltage gain of 1000. If 10% negative voltage series feedback is used, then the closed loop gain is
    A) 99.9   B) 9.9
    C) 0.9   D) 990

17. Which of the following statements are true for von Neumann architecture?
    A) Separate bus between the program memory and data memory   B) External bus for program memory and data memory
    C) External bus for data memory only   D) Shared bus between the program memory and data memory

18. Harvard architecture has _____
    A) Dedicated buses for data and program memory   B) Pipeline technique
    C) Complex architecture   D) All of these

19. The unit used for measuring message or information is
    A) Hertz   B) Ohms
    C) Bits per second   D) Meter per second

20. The inherent interference resistance property between wireless cellular channels is observed in
    A) Frequency Division Multiple Access   B) Time Division Multiple Access
    C) Code Division Multiple Access   D) Space Division Multiple Access

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I	Marks	BT*	CO*
1. a) With a neat circuit diagram, explain the principle of operation of a full wave bridge rectifier. Draw the relevant waveforms.	6	L2	1
b) Define efficiency and ripple factor of a rectifier. Deduce the maximum values of both parameters for a half wave rectifier.	6	L2	1
c) A 5V regulated power supply is required to produce from a 12V direct current (DC) power supply input source. The maximum power rating Pz of the Zener diode is 2W. Calculate:			
i) The maximum current following through the Zener diode,			
ii) The minimum value of the series resistor, Rs,			
iii) The load current I_L if a load resistor of 1kΩ is connected across the Zener diode,			
iv) The Zener current I_z at full load.	4	L3	1
2. a) Explain D.C. load line analysis of a Bipolar Junction Transistor (BJT) in Common Emitter (CE) configuration.	6	L2	2
b) Calculate α and β for a transistor with collector current of 1 mA, base current of 25 µA. Determine the new value of base current to give a collector current of 5 mA.	6	L3	2
c) With a neat circuit diagram, explain how BJT can be made to operate as a switch.	4	L2	2

a) With the neat construction diagrams, explain the drain characteristics of n-channel JFET. — 6 L2 2 1

b) For a Junction Field Effect Transistor (JFET), the $I_{DSS} = 6mA$, $V_p = -4.5V$. Determine the drain current I_D for the following cases:
   i) $V_{GS} = -2V$
   ii) $V_{GS} = -4V$. — 6 L3 2 1

c) Explain the working of a CMOS inverter with a neat circuit diagram. — 4 L2 2 1

Unit – II

a) With the help of a neat circuit diagram, derive the expression for output voltage of an inverting amplifier circuit using Op-amp. Draw the input and output waveforms considering the input voltage of 2V peak and a gain of 4. Assume the V^+ and V^- as ±12V. — 6 L2 3 1

b) Design a summing amplifier using Op-amp, to get an output voltage of $V_o = - (3V_1 + 4V_2 + 5V_3)$, assuming a feedback resistor of 120KΩ. Draw the circuit. — 6 L3 3 1

c) Draw the equivalent circuit of an Op-Amp and write the significance of each parameter in it. — 4 L1 3 1

a) With the help of a neat circuit diagram, derive the expression for the output voltage of an integrator circuit using Op-amp. — 6 L2 3 1

b) Draw the circuit of a IC 555 timer as an oscillator in astable mode. For an IC 555 based oscillator in astable mode, operating at a duty cycle of 75%, with frequency of operation 1kHz, the values of $R_2 = 3.6kΩ$ and $C = 0.1\mu F$. Calculate the value of the resistor R_1. — 6 L3 3 1

c) An amplifier has an open loop voltage gain of 1000. If the feedback factor is 10%, find the closed loop voltage gain. — 4 L3 4 1

a) State Barkhausen's criterion for generating sustained oscillations. Derive the conditions with the help of an oscillator block diagram. — 6 L2 4 1

b) With a neat circuit diagram, explain the operation of a RC phase shift oscillator. Analyse the role of RC components as feedback network. — 6 L2 4 1

c) In a Colpitts oscillator, $C_1 = 100pF$; $C_2 = 260pF$. Find the value of L if the frequency of oscillation is 40 kHz. — 4 L3 4 1

Unit – III

a) What is meant by modulation in communication system? Write the needs for modulation. — 6 L2 5 1

b) Explain the following concepts of a cellular system:
   i) Frequency reuse'
   ii) Capacity of a cluster. — 6 L2 5 1

c) Explain different control and voice channels available between a mobile unit and base station for the initiation of a call in a cellular system. — 4 L2 5 1

a) With a neat diagram, explain the various elements of an Embedded system. — 6 L2 5 1

b) Differentiate between Microprocessor and Microcontroller. — 6 L2 5 1

c) Discuss the optocoupler with a diagram. Diagrammatically show the usage of optocoupler. — 4 L2 5 1

BT* Bloom's Taxonomy, L* Level;   CO* Course Outcome; PO* Program Outcome
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