

## FACULTY OF ENGINEERING

B. E. I – Year (Backlog) Examination, December 2019

Subject: Mathematics – I

Time: 3 Hours

Max. Marks: 75

Note: Answer all questions from Part A and any Five questions from Part B.

### PART – A (25 Marks)

- 1) Test the convergence of the series  $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$
- 2) Examine the series  $1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^4} + \dots$  for convergence
- 3) State Rolle's Theorem.
- 4) Find the asymptotes parallel to coordinate axis for the curve  $x^2y^2 - x^2y - xy^2 + x + y + 1 = 0$ .
- 5) If  $u = F(x - y, y - z, z - x)$  prove that  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ .
- 6) If  $x = r \cos \theta, y = r \sin \theta$ , find  $\frac{\partial(x, y)}{\partial(r, \theta)}$ .
- 7) Prove that  $\nabla r^n = nr^{n-2} \vec{r}$ , where  $\vec{r} = xi + yj + zk$ .
- 8) Show that  $\vec{F} = (-x^2 + y^2)\hat{i} + (4y - z^2x)\hat{j} + (2xz - 4z)\hat{k}$  is solenoidal.
- 9) Find the rank of  $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$ .
- 10) Show that if  $\lambda$  is an eigenvalue of  $A$ ,  $\frac{1}{\lambda}$  is an eigenvalue of  $A^{-1}$ .

### PART – B (50 Marks)

11. Discuss the convergence of the series  $x + \frac{2^2x^2}{2!} + \frac{3^3x^3}{3!} + \frac{4^4x^4}{4!} + \dots$  10
12. a) Prove that if  $0 < a < b < 1$   
 $\frac{b-a}{1+b^2} < \tan^{-1}b - \tan^{-1}a < \frac{b-a}{1+a^2}$ , hence show that  $\frac{f}{4} + \frac{3}{25} < \tan^{-1} \frac{4}{3} < \frac{f}{4} + \frac{1}{6}$ . 5
- b) Find the envelope of the family of lines  $y = mx + \sqrt{1+m^2}$ ,  $m$  being the parameter. 5

contd...2

13. Given  $x + y + z = a$ , find the maximum value of  $x^m y^m z^p$ . 10
14. Evaluate  $\int_c (yz\hat{i} + zx\hat{j} + xy\hat{k}) \cdot ds$  where  $s$  is the surface of the sphere  $x^2 + y^2 + z^2 = a^2$  in the first octant. 10
15. a) Solve the system of equations  
 $x - 2y + 3z = 2$ ;  $2x + y + z + t = -4$ ;  $4x - 3y + z + 7t = 8$ . 5
- b) Use Cayley-Hamilton theorem to find inverse of  $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$ . 5
16. Reduce the quadratic form  $2x_1x_2 + 2x_1x_3 - 2x_2x_3$  to a canonical form by an Orthogonal transformation and discuss its nature. 10
17. a) Find the Taylor series expansion of  $f(x) = \sin x$  about  $x = \frac{\pi}{4}$  5
- b) Find the radius of curvature of the curve  $y^2 = x$  at  $(1, 1)$  5

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OU - 1607

**FACULTY OF ENGINEERING & TECHNOLOGY****B.E / B.Tech (Bridge Course) I-Semester (Backlog) Examination, December 2019****Subject : Engineering Physics****Time: 3 Hours****Max. Marks: 75****Note :** Answer all questions from part – A and any five questions from Part-B**PART– A (25 Marks)**

1. Newton's rings are formed with reflected light of wavelength  $5896\text{\AA}$  with liquid between glass plate and plano convex lens, is The diameter of the 5<sup>th</sup> ring is 0.3 cm and the radius of curvature of the lens is 100cm calculate the refractive index of liquid 3
2. Calculate the thinness of a quarter wave plate for a monochromatic light having a wavelength of  $6000\text{\AA}$ , If  $n_e = 1.5553$   $n_o = 1.544$  3
3. What is Holography? 2
4. Explain the physical significance of wave function ( $\Psi$ ) 2
5. Match the following 2

a) Population inversion	-	1) Semiconductor
b) LED	-	2) Laser
c) Core & cladder	-	3) Super conductor
d) Meissner effect	-	4) Optical fiber
6. Explain concept of a hole 2
7. Derive an expression for the Hall coefficient? 3
8. Distinguish between soft and hard magnetic materials? 3
9. Write few applications of nano materials 3
10. What is Bragg's law 2

**PART –B (50 Marks)**

11. a) Explain construction & working of a Nicolas prism 5
  - b) Derive the expression for wavelength of incident light by forming Newton's rings taking diameters of rings into account 5
12. a) Derive an expression for the Schrodinger time independent wave equation 5
  - b) Explain construction and working of semiconductor laser. 5
13. a) Define the atomic packing fraction? Calculate it for SC, BCC & FCC crystal system 5
  - b) What are the success and failures of classical free electron theory 5
14. a) What is the effect of frequency & temperature on dielectric polarization 5
  - b) Distinguish between the Dia, Para and Ferro magnetic materials 5
15. a) Describe the construction and working of Transmission Electron microscope (TEM) 5
  - b) Explain sol-gel synthesis for producing nano matirals 5
16. a) Derive an expression for carrier concentration of in intrinsic semiconductor. 5
  - b) What is super conductivity ? Mention their general properties. 5
17. a) Explain the preparation of optical fibers by double crucible method. 5
  - b) Describe Frauntioffer diffraction of light due to single slit and explain maxima & minima conditions. 5

## FACULTY OF ENGINEERING

B. E. I Semester (CBCS)(Backlog) Examination, December 2019

Subject : Engineering English

Time : 3 Hours

Max.Marks:70

Note: I. Answer all Questions from Part – A, & Any Five questions from Part – B

### PART – A (20 Marks)

1. Match the column A with column B (2)

A	B
1. To upgrade or expand	a. Surreal
2. That which is considered important	b. Circuits
3. a regular pattern of visits	c. Priorities
4. like a dream	d. Scalable

2. Write one word substitute for the following. (2)

- a) Something that is no longer in use \_\_\_\_\_  
 b) A person who speaks several languages \_\_\_\_\_

3. Pick the correct antonym from the options given to the italicized words of the following sentences. (2)

- a) This is a *barbarous* act.  
 i. civilised      ii. inhuman      iii. savage      iv. cruel  
 b) Destiny plays a *crucial* role in one's life.  
 i. deciding      ii. meaningful      iii. trivial      iv. general

4. Fill in the blanks in the sentence pairs with words that either sound the same or spelt the same. (2)

- a) The marine did not \_\_\_\_\_ the burning ship but struggled to save those who were hurt. I thought we could have ice-cream for \_\_\_\_\_  
 b) We will \_\_\_\_\_ you in the lobby.  
 Mother said we need to buy some eggs, \_\_\_\_\_ and vegetables

5. Circle the word that does not fit in with the others in each set. (2)

- a) football, cricket, tennis, hockey, badminton  
 b) glider, helicopter, aeroplane, submarine, hot-air balloon  
 c) cheek, chin, eyelid, forehead, toe  
 d) Atlantic, Pacific, North, Arctic, Indian

6. Choose the correct form of the verb from the options given in each sentence (2)

- a) The teacher as well as the students was/ were in the boat.  
 b) The suitcase along with the jewels were /was stolen  
 c) The exercises in the work book is/are difficult to solve.  
 d) Two and two make/makes four

7. Rewrite the following sentences after correcting the errors if any. (2)

- a) The climate of Sweden is colder than Switzerland.  
 b) Going towards the hut, the children saw a dog.

8. Convert the following into indirect speech (2)

- a) He said, "I feel glad about the whole thing."  
 b) Teacher said, "Shut the door."

**9. Fill in the blanks with suitable articles. (2)**

\_\_\_\_\_ official of a cellular service provider said: \_\_\_\_\_ Indian cellular market is \_\_\_\_\_ new and inexperienced one compared to that of the US and they have still a lot to learn about \_\_\_\_\_ gadget.

**10. Convert the following into the passive voice. (2)**

- a. They paid him a handsome salary.
- b. They have warned her to mind her own business.

**PART – B (50 Marks)**

11. (i) What does the 'communication' imply? Why is effective communication vital in today's world? (5)
- (ii) Discuss any four barriers to communication and substantiate with one example for each? (5)
12. (i) What are the major differences between hearing and listening? (5)
- (ii) How is listening important for a professional? (5)
13. (i) Write a paragraph in about 100 words on "The solution always lies in the problem" . (5)
- (ii) Expand the proverb "A rolling stone gathers no moss." (5)
14. Write a job application along with a resume for the post of a computer programmer in an MNC. (10)
15. Write meaning for the following technical words. (10)
- (a) barometer (b) compression (c) green waste (d) macadam (e) parity
16. Why is Sachin Tendulkar considered an iconic cricket player? (10)
17. What is Subject-Verb agreement? Mention any five rules with examples. (10)

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