Code No. 11002/BL

FACULTY OF ENGINEERING

B.E. I-Year (Backlog) Examination, May / June 2019

Subject : Mathematics-I

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Define the following and give an illustration to each. 3
   a) Conditionally convergent series
   b) Absolutely convergent series

2 Determine the nature of the series $\sum_{n=1}^{\infty}\left(\sqrt{n+1}-\sqrt{n}\right)$. 2

3 Find the Taylor series of $f(x) = e^x$ around $x = 3$. 3

4 Find the asymptotes of $y^2(x^2-1) = 1$. 2

5 Find the envelope of the family of circles $x^2 + y^2 - 2ax\cos\alpha - 2ay\sin\alpha = c^2$ where α is the parameter. 3

6 If $u = x^2 + y^2$, $v = x^2 - y^2$ then find the Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$. 2

7 Find the unit vector normal to the surface $x^2 - y^2 + z = 9$ at the point P(1, -1, 2). 3

8 If $F= (3x^2 + 6y)i - 14yzj + 20xz^2 k$ then evaluate $\int_C \overline{F}.d\,\bar{r}$ where C is the straight line joining (0,0,0) to (1,1,1). 2

9 Let 1, 2 be eigen values of a 2 x 2 matrix A. Then find the eigen values of the matrix $3A - A^{-1}$. 3

10 Show that the set B = {(2, 2, 0), (3, 0, 2), (2, -2, 2)} is a basis of IR^3 (IR). 2

PART – B (50 Marks)

11 a) Test for convergence of $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}x^n}{n}$ 5

   b) Test for convergence of $\sum_{n=1}^{\infty}\frac{x^{2n}}{n^2}$ where $x > 0$. 5

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12 a) Find the evolute of the curve 5
$x = a\cos\theta$, $y = b\sin\theta$

b) Trace the curve $y^2 = x^2\left(\frac{a+x}{b-x}\right)$. 5

13 a) Find the extreme values of the function
$f(x, y) = x^2 + y^2 + \frac{2}{x} + \frac{2}{y}$. 5

b) Find the Taylor series expansion of $f(x, y) = e^{2x}\sin 3y$ about origin upto third degree terms. 5

14 Verify Gauss divergence theorem for $\bar{F} = (x^3 - yz)i - 2x^2yj + zk$ taken over the entire surface of the cube $0 \le x \le a$, $0 \le y \le a$, $0 \le z \le a$. 10

15 a) Verify Cayley-Hamilton theorem for the matrix 5

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

b) Determine the nature, index and signature of the quadratic form 5
$x^2 + 5y^2 + z^2 + 2xy + 2yz + 2zx$.

16 a) Find the circle of curvature of the curve 5
$y = 4\sin x - \sin 2x$ at $x = \frac{®}{2}$

b) Evaluate $\int_{y=0}^{1}\int_{x=y}^{y^{1/3}} e^{x^2}\,dx\,dy$ by changing the order of integration. 5

17 a) Test for consistency and solve, if consistent the system of equations. 5
$x + y + z + w = 4$
$x + y + z - w = 2$
$x - y + z - w = 0$

b) Find the maximum value of $x\,y^2\,z^3$ when $x + y + z = 10$. 5

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Code No. 11366/BL

FACULTY OF ENGINEERING & Technology

BE/B. Tech (Bridge Course) I – Semester (Backlog) Examination, May/June 2019

Subject: Engineering Physics

Time: 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A, & any five Questions from Part-B

PART – A (25 Marks)

1. In Newton's rings experiment the diameter of 15^{th} dark ring changes from 1.6 cm to 1.3 cm, when a liquid is introduced between the lens and glassplate. Calculate refractive index of the liquid. (3)
2. Define Malus Law? (2)
3. What are the characteristics of a Laser? (2)
4. A step-index fiber has a core of refractive index 1.5 and a cladding of refractive index 1.98. Calculate the numerical aperture of the figure? (2)
5. Match the following: (3)

(i) Meissner Effect	(a) LASER
(ii) Stimulated Emission	(b) Superconductivity
(iii) Nicol's Prism	(c) Surface analysis
(iv) SEM	(d) Polarimeter

6. What happens to the Electric field of a dielectric due to Polarization? (2)
7. What are forbidden bands (2)
8. Write a short note on LED (3)
9. Distinguish between bulk, thin films and nano materials? (3)
10. Mention any three applications of Nano materials (3)

PART – B (50 Marks)

11. (i) Explain construction and working of a Nicol's Prism (5)
    (ii) Obtain the intensity expression for a single slit Fraunhoffer diffraction pattern. (5)
12. (i) What is Numerical aperture? Derive an expression for Numerical aperture. (5)
    (ii) Describe the construction and working of Ruby laser with suitable energy level diagram. (5)
13. (i) Explain the crystal systems and corresponding Bravais lattice. (5)
    (ii) Explain the salient features of Kronig-Penny model and how it leads to energy band formation. (5)

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14. (i) What are dielectrics? Explain the different types of dielectric polarization mechanisms. (5)

    (ii)Explain the Weiss molecular field theory of Ferromagnetism. (5)

15. (i) Write a note on Atomic force microscopy(AFm) (5)

    (ii) Explain pulsed laser deposition technique. (5)

16. (i) Derive the expression for wavelength of incident light by forming Newton's rings. (5)

    (ii) Derive time independent Schrodinger wave equation.

17. (i) State and explain Hall Effect? Obtain an expression for Hall Coefficient. (5)

    (ii) Distinguish between type I and type II Super conductors. (5)

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