Code No. 4

FACULTY OF ENGINEERING

B.E I – Year (Backlog) Examination, December, 2017
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 a Newton's rings experiment the diameter of 10^{th} ring changes from 1.40 to 1.27 cm when a drop of liquid is introduced between the lens and the glass plate. Calculate the refractive index of the liquid. [2]
2. Distinguish between Fresnel and Fraunhofer diffraction [3]
3. Mention few applications of optical fibres [2]
4. Derive Rayleigh Jeans Law and Wien's Law from Planck's Law [3]
5. What are Miller indices and explain with good example [3]
6. Discuss merits and demerits of classical free electron theroy [3]
7. Write a note on frequency and temperature dependence of dielectric polarization [3]
8. Calculate the critical current for a wire of lead having a diameter of 1mm at 4.2K. Critical temperature for lead is 7.18K and critical field at 0K is 6.5 x 10^4 A/m [2]
9. What are bulk and thin films? [2]
10. Write some properties of Nano - materials [2]

PART – B

11. a) Describe the construction of Nicol's prism and explain how it can be used as polarizer. [5]
    b) Discuss how hologram is recorded and how image is constructed from it [5]

12 a) What are fermions and obtain the Fermi – Dirac distribution function for fermions [5]
    b) Explain the working principle of an optical fiber [5]

13. a) Define the term Packing Fraction and find its value for SCC, BCC, FCC [4]
    b) Explain qualitatively Kronig Penny Model with discuss its conclusions [6]

14 a) What are different types of polarizations and derive an expression for ionic polarizability [5]
    b) Distinguish between soft and hard magnetic materials [5]

15 a) Explain sol-gel technique in preparing thin film
    b) What are carbon Nano tubes and mention few applications [5]

16. a) Discuss Fraunhofer's diffraction at a single slit and explain intensity distribution [5]
    b) Apply the schroedinger's wave equation to a particle in an infinite square well potential and calculate its eigen values [5]

17. a) Distinguish between Type - 1 and Type - 2 superconductors [5]
    b) State and explain Hall Effect [5]

****

Code No: 422

FACULTY OF ENGINEERING AND TECHNOLOGY

B.E/ B. Tech (Bridge Course) II-Semester Backlog Examination, December 2017

Subject: Mathematics

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

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

PART-A

1. A coin is tossed thrice. Find the sample space [3]
2. Define discrete random variable [2]
3. Find the value of C of Rolle's Theorem for f(x) =x^2 in [-1, 1]. [3]
4. Obtain the curvature of the curve y^2=x at (1, 1). [2]
5. Evaluate $\int x e^x dx$ [3]
6. Find the area of the circle $(x-1)^2+y^2=4$ [2]
7. If $\vec{F} = xy\,\hat{\text{i}} + \text{yz}\hat{\text{j}} + \text{zx}\hat{\text{k}}$, find $\nabla.\vec{F}$ [3]
8. State Gauss's divergence theorem. [3]
9. Define Beta and Gamma functions [3]
10. Show that erf(x)+erfc(x)=1 [2]

PART-B

11. (a) Find the median wage of the following distribution: [5]

Wages (in Rs.)	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000
No. of Workers	3	5	20	10	5

(b) $If\ P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, \text{P}(\text{A}\cap\text{B}) = \frac{1}{5}$, then find (i) $\text{P}(\text{A}\cap\text{B})$ (iii) $\text{P}(\text{A}\cap\text{B}^{\text{c}})$ and (iii) $\text{P}(\text{A}^{\text{c}}\cap B^{c})$ [5]

12. (a) State and prove Cauchy's mean value theorem [5]

(b) Find the Taylor series expansion of f(x) =cosx about $x = \frac{®}{4}$ [5]

13. (a) Evaluate $\iint_R e^{2x+3y}\,dx\,dy$ over the triangle bounded by x=0, y=0 and x+y=1 [5]

(b) Evaluate $\int_0^{\ln c}\int_0^{\ln b}\int_0^{\ln a} e^{x+y+z}\,dx\,dy\,dz$ [5]

14. (a) Find the directional derivative of the scalar function $f(x, y, x) = xy + yz + zx$ at (1,2,0) in the direction of the vector $\hat{\text{i}} + 2\hat{\text{j}} + 2\hat{\text{k}}$. [5]

(b) If $\vec{a}$ is a constant vector and $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, prove that div ($\vec{a}$ x $\vec{\text{r}}$) =0 [5]

15. (a) Prove that $(m, n) = \frac{\Gamma m\,\Gamma \text{n}}{\Gamma(m+n)}$ [5]

(b) Evaluate $\int_0^1 (\ln \frac{1}{x})^{n-1} dx, n > 0$ [5]

16. (a) State and prove multiplication theorem of probability [5]

(b) Find the envelope of the family $(x-c)^2+(y-c)^2=c^2$, c is parameter [5]

17. Verify Green's theorem for $\oint_C e^{-x} \sin y \, dx + e^{-x} \cos y \, dy$, where C is the rectangle with vertices at $(0,0), (\circledR,0), (\circledR,\frac{\circledR}{2}), (0,\frac{\circledR}{2})$. [10]

****

FACULTY OF ENGINEERING

B.E. I-Semester (Main & Backlog) Examination, Dec, 2017
Subject: Engineering Mathematics-I

Time: 3 hours **Max. Marks: 70**

Note: Answer all questions from Part-A and any Five Questions from part-B

PART – A (20 Marks)

1. Find the value of λ such that the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & a \end{bmatrix}$ is 2. [2]

2. Find the sum and product of the eigen values of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$. [2]

3. Test the convergence of the series $\sum_{n=1}^{\infty} \frac{4n^3+2}{7n^3+2n}$. [2]

4. Define the terms i) Absolute convergence and ii) Conditional convergence of a series with arbitrary terms. [2]

5. Find the radius of curvature of the curve $y = x^2-3x+5$ at (1, 3). [2]

6. Find the envelope of the family of straight lines $y = mx + \frac{a}{m}$ where 'm' is the parameter and 'a' is a constant. [2]

7. If $z=y+f(u)$, $u = \frac{x}{y}$ then show that $u\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 1$. [2]

8. If $u=x^2+y^2$, $\nu=2xy$, find $\frac{\partial(u,\neg)}{\partial(x,y)}$. [2]

9. Show that $\vec{V} = 12x\hat{i} - 15y^2\hat{j} + \hat{k}$ is irrotational. [2]

10. Find ∇f at (1, 2, -1) if $f(x, y, z) = \log_e(x+y+z)$. [2]

PART – B (50 Marks)

11. a) Test for consistency and solve if consistent

$x+2y+z=3;$ $2x+3y+2z=5;$ $3x-5y+5z=2;$ $3x+9y-z=4.$

b) Find the eigen values and eigen vectors of the matrix.

$$\begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}.$$ [5]

12. a) Test the convergence of the series.

$$\frac{x}{1.2}+\frac{x^2}{2.3}+\frac{x^3}{3.4}+\frac{x^4}{4.5}+\cdots\cdots\cdots\cdots \text{to } \infty$$ [5]

b) Test the following series for conditional convergence.

$$\sum_{n=1}^{\infty}(-1)^{n-1}\frac{n}{n^2+1}$$ [5]

13. a) Verify Lagrange's Mean Value Theorem for f(x)=x (x-1) (x-2), $x\in[0, 1/2]$. [5]

b) Find the evolute of the parabola $x^2=4ay$. [5]

14. a) Expand f(x, y)=$\tan^{-1}(xy)$ as a Taylor series about (1,1) upto terms of second degree. [5]

b) Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at (0,0) given

$$f(x,y)=\begin{cases} \dfrac{xy}{x^2+2y^2}, & (x,y)\neq(0,0) \\ 0, & (x,y)=(0,0) \end{cases}$$ [5]

15. a) Find the directional derivative of ¤ $= xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface x $\log_e z - y^2 = -4$ at (-1,2,1). [5]

b) If $\vec{F}=(5xy-6x^2)\hat{i}+(2y-4x)\hat{j}$, evaluate $\int_C \vec{F}.d\vec{R}$ along the curve C in the xy-plane given by $y=x^3$, from the point (1,1) to (2,8). [5]

16. a) Using Cayley- Hamilton theorem find A^{-1}

if $A=\begin{bmatrix} 1 & 1 & 2 \\ 0 & -2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$. [5]

b) Test the convergence of the series $\sum_{n=1}^{\infty}\left(\frac{n}{n+1}\right)^n x^n, (x>0)$. [5]

17. a) Find the maxima and minima of f(x, y) $=x^4+y^4-2x^2+4xy-2y^2$. [5]

b) Prove that $\nabla\cdot\left(\nabla\times\vec{A}\right)=0$, Where $\vec{A}$ is a vector point function. [5]

****