Code No.14418/BL

FACULTY OF ENGINEERING

B.E / B.Tech (Bridge Course) I – Semester (Backlog) Examination,

October 2021

Subject: Engineering Physics

Time: 2 Hours **Max.Marks: 75**

Note: Missing data, if any, may be suitably assumed.

PART – A

Answer any seven questions. **(7x3 = 21 Marks)**

1 Newton's rings are observed between a spherical surface of 100cm radius and a plane glass plate. Calculate the wave length of light used if diameter of 12^{th} bright ring is 0.59cm.
2 Calculate packing fraction of SC, BC, FCC.
3 Explain optical activity.
4 Distinguish optical fibers in brief based on their refractive index.
5 Write a note on frequency dependence of dielectric polarization.
6 Discuss the success and failures of classical free electron theory.
7 Explain how population inversion is related to pumping.
8 Define diffraction.
9 Distinguish between dia, para, and Ferro, materials based on their spin alignment.
10 Explain how the properties of materials change at nano scale.

PART – B

Answer any three questions. **(3x18 = 54 Marks)**

11 a) Derive the grating equation and also discuss the intensity conditions with intensity distribution graphs.
b) Explain construction and working of Laurent's half shade polarimeter.

12 a) Drrive an expression for 1-D Schrödinger time independent wave equation.
b) Discuss in detail the general properties of super conductors.

13 a) Explain the construction and working of He-Ne laser with neat diagram.
b) Describe the classification of optical fibers in detail.

14 a) What are bravais lattice and explain in detail about different crystal systems.
b) Derive an expression for carrier concentration in intrinsic semiconductors.

15 a) Give the different types of polarization? Obtain an expression for ionic Polarizability
b) Discuss Weiss molecular field theory of ferromagnetism. .

16 a) Explain the sol-gel method of preparing Nano materials.
b) Describe the construction and working of atomic force microscope (AFM).

17 a) Explain about newton's rings experiment
b) Write a short note on quarter wave plate and half wave plate.

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FACULTY OF ENGINEERING

B.E. I – Year (Backlog) Examination, October 2021

Subject: Mathematics - I

Time: 2 Hours **Max. Marks: 75**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer any seven questions. **(7x3 = 21 Marks)**

1 Discuss the convergence of the series $\sum\left(1+\frac{1}{n}\right)^{-n^2}$.

2 State Raabe's test.

3 Find the Taylor series expansion of $f(x)=x^3+2x^2+3x+2$ about $x=1$.

4 Find the radius of curvature of the curve $y=x^2$ at (1,1).

5 Determine $\lim_{(x,y)\to(1,2)}\frac{x+2y}{2x+y}$.

6 If $x=r\cos\theta, y=r\sin\theta$, then find $\frac{\partial(x,y)}{\partial(r,\theta)}$.

7 Find a unit normal vector to the surface $x^2+3y^2+2z^2=6$ at (2,0,1).

8 State Green's theorem.

9 Show that the vectors (1,2,3), (0,1,-1), (1,3,2) are linearly dependent.

10 Find the sum and product of the eigen values of the matrix $A=\begin{pmatrix}1 & 2\\ 3 & 5\end{pmatrix}$.

PART – B

Note: Answer any three questions. **(3x18 = 54 Marks)**

11 (a) Discuss the convergence of the series $\frac{1}{2\sqrt{1}}+\frac{x^2}{3\sqrt{2}}+\frac{x^4}{4\sqrt{3}}+\ldots\ldots$

(b) Prove that the series $\sum(-1)^{n-1}\frac{\cos^2 nx}{n\sqrt{n}}$ is absolutely convergent.

12 (a) State and prove Lagrange's mean value theorem.

(b) Find all asymptotes of the curve $x^3+y^3=3axy$.

13 (a) If $z=u^2+v^2$ and $u=at^2$, $v=2at$ find $\frac{dz}{dt}$.

(b) Find the maximum and minimum values of the function $f(x,y)=y^2+4xy+3x^2+x^3$.

14 Verify Stoke's theorem for $\vec{F}=x^2\hat{i}-xy\,\hat{j}$ around the square in the plane $z=0$ and bounded by the lines $x=0, y=0, x=a, y=a$.

..2..

15 Find the eigen values and eigen vectors for the matrix $A=\begin{pmatrix}1 & 1 & 1\\ 1 & 2 & 1\\ 3 & 2 & 3\end{pmatrix}$.

16 (a) Verify Rolle's theorem for $f(x)=(x-1)^2(x-2)^3$ in [1,2].

(b) Evaluate $\int_0^1\int_0^1\int_0^1 e^{x+y+z}\,dzdydx$.

17 (a) If $\vec{F}=\text{grad}\left(x^3+y^3+z^3-3xyz\right)$, find curl $\vec{F}$.

(b) Find the nature, index and signature of the quadratic form Q= $2\left(x^2+xy+y^2\right)$.

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Code No. 15159/AICTE/BL

FACULTY OF ENGINEERING
B.E. I - Semester (AICTE) (Backlog) Examination, October 2021

Subject: Mathematics - I

Time: 2 Hours **Max. Marks: 70**

Note: i) First Question is compulsory and answer any three questions from the remaining six questions.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) **Missing data, if any, may suitably be assumed.**

Note: Answer any four questions. **(4x4 = 16 Marks)**

1 (a) Examine the convergence of the series $\sum_{n=2}^{\infty} \frac{1}{\log n}$.

(b) State Raabe's test.

(c) Verify Rolle's theorem to the function $f(x)=(x+2)^3(x-3)^4$ *in* $(-2,3)$.

(d) If $z = f(ax+by)$, then show that $b\frac{\partial z}{\partial x} - a\frac{\partial z}{\partial y} = 0$.

(e) If $u = f(x-y, y-z, z-x)$, *then show that* $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.

(f) Evaluate $\iint_R xy\, dxdy$ where R is the domain bounded by x-axis, ordinate x=2a and the curve $x^2 = 4ay$.

(g) Find the normal vector to the surface $xy^3z^2 = 4$ at the point (-1,-1,2).

Note: Answer any three questions. **(3x18 = 54 Marks)**

2 (a) Test the convergence of the series $\sum_{n=2}^{\infty} \frac{(n!)^2}{(2n!)} x^{2n}$.

(b) Find the nature of the series $\sum_{n=1}^{\infty} \left(\sqrt[3]{(n^3+1)} - n\right)$.

3 (a) Find Taylor's series expansion of the function $f(x) = \sin x$ about the point $x = \frac{\pi}{4}$.

(b) Show that evolute of cycloid $x = a(\theta - \sin\theta)$, $y = a(1-\cos\theta)$ is another cycloid.

4 (a) If $u = x+y+z$ $uv = y+z$, $uvw = z$, show that $\frac{\partial(x,y,z)}{\partial(u,v,w)} = u^2v$.

..2..

(b) If $f(x,y)=\begin{cases}\dfrac{x^2+y^2}{x-y}, & (x,y)\neq(0,0)\\ 0, & (x,y)=(0,0)\end{cases}$ then show that $f(x,y)$ is not continuous at (0,0). Also find f_x (0,0) and f_y (0,0).

5 (a) Change the order of integration in $I=\int_0^1\int_x^{\sqrt{2-x^2}}\frac{x}{\sqrt{x^2+y^2}}dydx$ and hence evaluate it.

(b) Evaluate $\iint xy(x+y)dxdy$ over area between $y=x^2$ *and* $y=x$.

6 (a) Find the angle between the surfaces $x^2+y^2+z^2=9$ *and* $z=x^2+y^2-3$ at the point (2,-1,2).

(b) Use Stoke's theorem to evaluate $\int_C[(x+y)dx+(2x-z)dy+(y+z)dz]$ where C is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6).

7 (a) Find the maximum distance of the point (3,4,12) from the sphere $x^2+y^2+z^2=4$.

(b) Find the coordinates of the center of curvature at any point of the parabola $y^2=4ax$. Hence show that its evolute is $27ay^2=4(x-2a)^3$.

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