FACULTY OF ENGINEERING
B.E. I - Semester (CBCS) (Backlog) Examination, March / April 2022
(Common Paper for all Branches)
Subject: Engineering Physics – I

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

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

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 Distinguish between Coherent and Non-coherent sources.
2 Define Fraunhoffer class of diffraction.
3 Explain Malus law.
4 Write few applications of Lasers.
5 Draw the refractive index profile of different optical fibers.
6 State four applications of Ultrasonic waves.
7 State Rayleigh-Jean's law of radiation?
8 Explain concept of Phase space?
9 State the De Broglie wavelength?
10 Explain Displacement current?

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 (a) Give the relation between path difference and phase difference?
   (b) Deduce an expressions for maxima and minima due to Diffraction at single slit?

12 (a) Explain the Spontaneous and Stimulated emissions?
   (b) Deduce the relations among Einstein's coefficients?

13 (a) What is Piezoelectric effect?
   (b) Discuss the Fibre drawing process by Double Crucible method?

14 (a) Explain the concept of ensemble?
   (b) Derive Fermi-Dirac distribution equation?

15 (a) Write four properties of Wave function?
   (b) Deduce the Schrodinger's time dependent wave equation?

16 (a) State the Maxwell equations in Integral and differential form?
   (b) Deduce an expression for plane electromagnetic wave equations?

17 (a) Explain the basic principles of holography?
   (b) Deduce an expression for Plank's law of Black body radiation?

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FACULTY OF ENGINEERING
B.E. I - Year (NON-CBCS) (Backlog) Examination, March / April 2022
(Common Paper for All Branches)
Subject: Engineering Chemistry

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

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

PART – A

Note: Answer all questions.   **(25 Marks)**

1. Draw expected shape of graph for conductometric titration of strong acid against strong base.
2. What do you understand by the term pitting corrosion?
3. Explain the term polymer and degree of polymerization.
4. Define calorific value of fuel? Mention different types of fuels.
5. Classify lubricants and give one example each.
6. Distinguish between electrolytic and galvanic cells.
7. List the specifications of potable water.
8. Explain the differences between thermoplastic and thermoset resins? Give one example each.
9. List the requirements of a good fuel?
10. Define the terms (i) Phase and (ii) degrees of freedom.

PART – B

Note: Answer any five questions.   **(5 x 10 = 50 Marks)**

11. (a) Derive Nernst Equation. Mention any two of its application.
    (b) Construct Methanol – Oxygen fuel cell and explain its reactions and mention the applications.

12. (a) Explain electrochemical theory of corrosion.
    (b) Explain softening of hard water by ion-exchange method.

13. (a) Give the method of the preparation, properties and uses of Kevlar.
    (b) Classify conducting polymers? Mention their applications.

14. (a) Explain catalytic cracking by moving bed method with the help of neat sketch.
    (b) Explain the classification of rocket fuels. Give one example each.

15. (a) Define lubricant. Explain any one type of mechanism of lubrication.
    (b) What is triple point? Explain the phase diagram of water system.

16. (a) Explain the construction and working of calomel electrode.
    (b) Describe the estimation of hardness of water by EDTA method.

17. (a) What are the sources, properties and significance of biodiesel?
    (b) Explain any five principles of green chemistry.

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FACULTY OF ENGINEERING

B.E. II / IV (Bridge Course) II Semester (Backlog) Examination, March / April 2022

Subject: Mathematics

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

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

PART – A

Note: Answer all questions.   **(25 Marks)**

1. From 20 tickets marked form 1 to 20, one ticket is drawn at random. Find the probability that it is marked with a multiple of 3 or 5.

2. In a moderately skewed distribution, the value of mode is 120 and that of median is 140. Find the value of arithmetic mean.

3. Show that $|sinx - siny| \leq |x - y|$ for all $x, y \in R$.

4. Find the coefficient of x^2 in the Taylor's series expansion of $f(x) = \frac{1}{x+2}$ around $x = 3$.

5. Evaluate $\int\limits_{4}^{5} \int\limits_{1}^{2} \frac{1}{(x+y)^2} \, dy \, dx.$

6. Evaluate $\int\limits_{0}^{4} \int\limits_{0}^{4-x} \int\limits_{0}^{4-x-y} xyz \, dz \, dy \, dx.$

7. If $F(x, y, z)$ is any scalar point function then evaluate $\nabla X (\nabla F)$.

8. If $\overrightarrow{F} = x^2 yi - xy^2 j$, evaluate $\int\limits_{c} \overrightarrow{F}.\overrightarrow{dr}$ where C is the curve $y = x^2$ from $A (0,0) \, to \, B (3,9)$.

9. Evaluate $\Gamma \frac{5}{2}$

10. Evaluate $\int\limits_{0}^{\infty} e^{-5x}(1 - e^{-x})^3$ in terms of Beta function.

PART – B

Note: Answer any five questions.   **(5 x 10 = 50 Marks)**

11. A Can hit a target 3 times in 5 shots, B can hit 2 times in 5 shots and C can hit 3times in 4 shots. They fire a volley. What is the probability that
(i) two shots hit, (ii) at least two shots hit?

12. (i) Find the evolute of the parabola $y^2 = 4ax$.

    (ii) Find the envelope of the family of curves $\frac{x}{a} cos \, \alpha + \frac{y}{b} sin \, \alpha = 1$ where α is a parameter.

13. (i) Evaluate $\int \frac{1}{(e^x - 1)^2} dx$.

   (ii) Evaluate $\int \frac{x^2 + 1}{x^4 + 1} dx$.

14. Verify Stoke's theorem for $F = (x^2 + y^2)i - 2xy\,j$ taken around the rectangle bounded by the line $x = \pm 3,\quad y = 0, and\ y = 4$.

15. (i) Show that $\mathrm{erf}(-x) = -\mathrm{erf}(x)$.

   (ii) Show that $\frac{d}{dx}[\mathrm{erf}(\alpha x)] = \frac{2\alpha}{\sqrt{\pi}} e^{-\alpha^2 x^2}$.

16. Find the volume of the solid generated by the revolution about the x-axis of the loop of the curve $9y^2 = x(3 - x)^2$.

17. (i) Find the angle between the surfaces

   $z = x^2 + y^2,\quad z = 2x^2 - 3y^2\ at\ P(2,1,5)$.

   (ii) Find the radius of curvature of the curve

   $xy^3 = 16$ at $P(2,2)$

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