Code No. 14004

FACULTY OF ENGINEERING

B.E. I-Year (Backlog) Examination, March/April 2021

Subject : Engineering Chemistry

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

PART – A

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

1 Define and explain single Electrode potential.
2 What are reversible and irreversible cells?
3 What do you understand by Break point chlorination?
4 Give any three differences between anodic and cathodic coatings.
5 Define functionality of monomer. Give its significance.
6 Mention any three properties of composites.
7 Write the composition of Liquid petroleum gas.
8 Define HCV and LCV of a fuel.
9 What are cholestric liquid crystals? Give example.
10 Define acid value of an oil. Give its importance.

PART – B

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

11 (a) Discuss the construction and working of calomel electrode with special reference to the chemical reactions involved when acting as anode and cathode.
(b) Calculate the equilibrium constant for the following reaction at 298 K.

$$Cu + Cl_2 \rightarrow CuCl_2$$

$E^oCu^{+2}/Cu = 0.34V$; $E^oCl_2/Cl^- = 1.36$ V

12 (a) What is the principle involved in the cathodic protection? Discuss the sacrificial anodic and impressed current methods.
(b) Explain the mechanisms of electrochemical corrosion.

13 (a) What is the principle involved in Electroless plating? Explain it with special reference to copper plating.
(b) 0.5 gm to $CaCO_3$ was dissolved 0.1 m HCl and diluted to 100 ml. 50 ml of this solution required 48 ml of EDTA solution for titration. 50 ml of same sample on boiling, filtering required 15 ml of EDTA solution. 50 ml of same sample on boiling, filtering required 10ml of EDTA solution. Calculate temporary permanent and total hardness of water sample.

14 (a) Differentiate between Thermoplastic and Thermosetting resins.
(b) What are conducting polymers? Explain the mechanism of conduction in polyacetylene.

15 (a) What do you understand by cracking? Discuss the catalytic cracking by moving bed method.
(b) Define HCV and LCV. How would you determine the calorific value by Junker's method?

16 (a) Define the terms involved in phase rule. Explain them with suitable examples.
(b) Explain the application of phase rule to Lead-Silver system.

17 (a) Discuss the composition and properties of composites.
(b) Explain the twelve principles of Green chemistry.

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Code No. 14505/CBCS

FACULTY OF ENGINEERING

B.E. I-Semester (CBCS)(Backlog) Examination, March/April 2021

Subject : Engineering Mathematics – I

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

PART – A

Note: Answer any Five Questions **(5x2 = 10Marks)**

1 Define echelon form of a matrix.

2 Find the index and signature of the quadratic form $Q = 2x^2 + 2xy + 2y^2$.

3 Examine the series $\sum \left(\frac{1}{2^n} + \frac{1}{n^{1/n}} \right)$ for convergence.

4 State Leibnitz's test.

5 Discuss the applicability of Rolle's theorem for f(x) = tan x in [0, π].

6 Find the equation of the envelope of the family of curves x cos p + y sin p = 5.

7 Find the total differential of u(x, y, z) = e ^{xyz}.

8 If u = $x^2 + y^2$, $v = y$, $x = r$ cos θ and $y = r$ sin θ, find $\frac{\partial(u,v)}{\partial(r,\theta)}$.

9 Evaluate $\nabla(\ell n\, r)$, where, $r = |\vec{r}|, \vec{r} = x\,\hat{i} + y\,\hat{j} + z\,\hat{k}$, $\ln r = \log_e r$.

10 Show that $\vec{F} = (y^2 \cos x + z^3)\,\hat{i} + (2y \sin x - 4)\,\hat{j} + 3xz^2\,\hat{k}$ is irrotational.

PART – B

Note: Answer any Four Questions **(4x15 = 60Marks)**

11 Show that the matrix $A = \begin{pmatrix} -3 & -2 & 1 \\ -2 & 0 & 4 \\ -6 & -3 & 5 \end{pmatrix}$ is diagonalizable. Find the matrix P such that $P^{-1}AP$ is a diagonal matrix.

12 (a) Discuss the convergence of the following series

$$\frac{1}{2} + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 x^2 + \left(\frac{4}{5}\right)^3 x^3 + \ldots\ldots (x > 0).$$

(b) Test the series $\sum \frac{\cos n\pi}{n^2 + 1}$ for absolute or conditional convergence.

13 (a) Find the equation of the circle of curvature of the curve $x^3 + y^3 - 6xy = 0$ at (3, 3).

(b) Sketch the graph of the curve $y = \frac{x}{1 + x^2}$.

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14 (a) Show that the function $f(x,y)=\begin{cases}\dfrac{x^3+y^3}{x^2+y^2}, & (x,y)\neq(0,0)\\ 0, & (x,y)=(0,0)\end{cases}$ is continuous at (0, 0) and possesses partial derivatives $f_x(0,0)$ and $f_y(0,0)$.

(b) Find the extreme values of $f(x, y, z)= x^2 + y^2 + z^2$ subject to the condition $xyz = 8$

15 Verify Gauss's divergence theorem for $\vec{F} = y\,\hat{i} + x\,\hat{j} + z^2\,\hat{k}$ over the cylindrical region bounded by $x^2 + y^2 = 9$, $z = 0$ and $z = 2$.

16 (a) Verify Cayley-Hamilton theorem for $A=\begin{pmatrix}2 & 1\\ 2 & 4\end{pmatrix}$ and find A^{-1}.

(b) Expand $f(x , y)=e^{xy}$ in Taylor series about (1, 1,).

17 (a) If $w= xy + yz + zx$, $x= t^2$, $y = te^t$, $z = te^{-t}$, find $\dfrac{dw}{dt}$.

(b) Find the directional derivative of the scalar function $f(x, y, z) = xyz$ at (1, 4, 3) in the direction of the line from (1, 2, 3) to (1, -1, -3).

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Code No. 14422

FACULTY OF ENGINEERING

B. E. (Bridge Course) II – Semester (Backlog) Examination, March/April 2021

Subject: Engineering Mechanics

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

PART – A

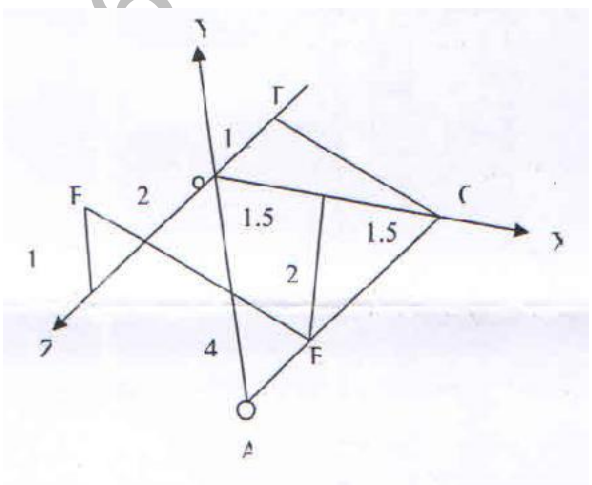
Answer any seven questions. **(7x3 = 21 Marks)**

1. Explain the characteristics of a Force.
2. Explain the concept of "Free body diagram" with example.
3. State Pappus theorems.
4. State the laws of friction.
5. A body weight 1000N moves on a level horizontal road for a distance of 400 m. The resistance of the road is 10 m per 1000N wt of the body. Find the work done on the body by its resistance.
6. Show that path of a particle in projectile motion is a parabolic.
7. The motion of a fly wheel is defined by the relation $\theta = t^3-8t+15$, where θ is expressed in radians and t in sec. Determine the angular displacement, angular velocity and angular acceleration after 2 sec.
8. Discuss briefly about different types of motion.
9. What is the moment of inertia and radius of gyration of a solid circular section of diameter 'd' about its diametrical axis.
10. Explain free and forced vibrations.

PART – B

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

11. Find the length of common perpendicular between line CD and BE.



12. Determine the smallest angle 'θ' for equilibrium of ladder of length 'L' and weight 'w' resting against vertical wall B and floor at A. The coefficient of static friction if 'μ' for all surfaces of contact. (10)
13. Determine moment of inertia of the T section of flange 200x 15mm and centrally placed web of 20 x 150mm with respect to centroidal axis xx and about its base line. (10)

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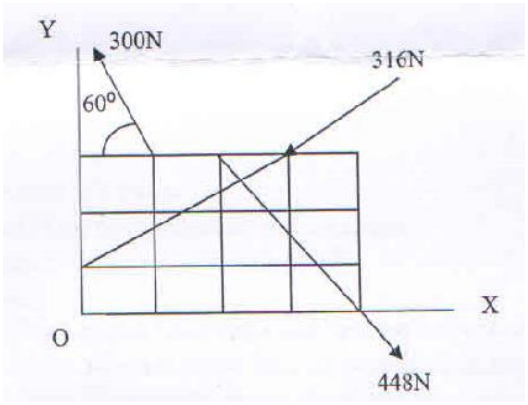
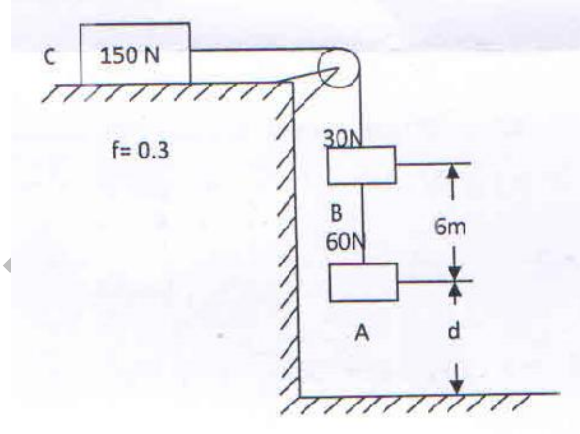
14. A flat plate is subjected to coplanar force system. Find resultant and its X and Y intercepts. Each grid is a square of 1 m X 1m.



15. (a) A projectile is fired top of a tower 100m high with a velocity of 100 m/sec, at 60 to horizontal. Find horizontal range through base of the tower.

(b) Determine the Moment of Inertia of a circular cone about its geometric axis.

16. The system is connected by flexible inextensible cards. If the system starts from rest, find the distance 'd' between A and ground so that, the system comes to rest with body B just touching A.



17. (a) State and prove Transfer formula for moment of Inertia.

(b) A simple harmonic motion is defined by the relation a = 36S, Determine the period and frequency.

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