

FACULTY OF ENGINEERING
B.E. II Semester (Bridge Course) (Backlog) Examination, November 2021

Subject: Mathematics

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 In a survey of 5 cement companies, the profit (in Rs. Lakh) earned during a year was 15, 20, 10, 35 and 32. Find the arithmetic mean of the profit earned.
- 2 Define discrete random variable with an example.
- 3 State Lagrange's mean value theorem.
- 4 Find the envelope of the family of lines $y = cx + c^2$.
- 5 Integrate $\sin x \sec x$.
- 6 Evaluate $\int_0^1 \int_0^1 dx dy$.
- 7 If $f(x, y, z) = \log(x^2 + y^2 + z^2)$, find ∇f .
- 8 Show that the vector $\vec{F} = (2x + 3y)\hat{i} + (x - y)\hat{j} - (x - y + z)\hat{k}$ is solenoidal.
- 9 Evaluate $\Gamma\left(\frac{5}{2}\right)$.
- 10 Define complementary error function.

PART – B

Note: Answer any three questions.

(3x18 = 54 Marks)

- 11 (a) Find the median for the following data:

Mid value:	15	20	25	30	35	40	45	50	55
Frequency:	2	22	19	14	3	4	6	1	1

 (b) State and prove addition theorem of probability.
- 12 State and prove Cauchy's mean value theorem and hence find the value of C of the theorem for $f(x) = x^2$ and $g(x) = x^3$ in $[1, 2]$.
- 13 (a) Find the volume of the solid generated by revolving the region bounded by the curves $y = 3 - x^2$ and $y = -1$ about the line $y = -1$.
 (b) Evaluate $\int_0^1 \int_{y^2}^{1-x} \int_0^1 x dz dx dy$.
- 14 Verify Green's theorem for $\int_C e^{-x} \sin y dx + e^{-x} \cos y dy$, where C is the square with vertices at $(0, 0), \left(\frac{\pi}{2}, 0\right), \left(\frac{\pi}{2}, \frac{\pi}{2}\right), \left(0, \frac{\pi}{2}\right)$.

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15 Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.

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

(b) Find the Taylor series expansion of $f(x) = e^x$ about $x = 2$.

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

(b) Show that $\int_0^1 \left(\log \frac{1}{x}\right)^{n-1} dx = \Gamma(n), (n > 0)$.

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FACULTY OF ENGINEERING
B.E. I - Year (Backlog) Examination, November 2021

Subject: Engineering Chemistry

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 Write any two advantages of fuel cells.
- 2 Give the Nernst's equation and write its significance.
- 3 What is Pourbaix diagram? Give its applications.
- 4 Explain the principle involved in electroless plating.
- 5 Write any two advantages and two applications of composites.
- 6 What do you understand by functionality of monomer? Give its significance.
- 7 Define the terms HCV and LCV.
- 8 Give the composition of CNG and mention two uses of it.
- 9 What is acid value? Give its importance.
- 10 What are phase rule and condensed phase rule?

PART – B

Note: Answer any three questions.

(3x18 = 54 Marks)

- 11 (a) What is electrochemical series? Explain its applications with suitable examples.
(b) Explain the construction of Calomel electrode with a neat diagram. Give the chemical reactions involved when it is acting as anode and cathode.
- 12 (a) What is the process of Chlorination? What are the advantages? Explain the significance of breakpoint chlorination.
(b) Explain the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion. Discuss the impressed current cathodic protection.
- 13 (a) Why conducting polymers are needed to the present world? Write the advantages and applications of conducting polymers by taking suitable examples.
(b) What do you understand by Polymerization? Define the addition and condensation polymerizations. Differentiate Thermoplastic and Thermosetting plastics.
- 14 (a) What is the principle involved in the rocket propulsion? Discuss the characteristics of good propellant.
(b) The percentage composition of a sample of coal is C=88, H=4, O=4, N=1, S=1 and the remaining being ash (by weight). Estimate the minimum weight of air required for the combustion of 1 kg of coal.
- 15 (a) What are the different mechanisms of lubrication? Discuss the boundary film lubrication.
(b) Discuss the application of Phase rule to the Water system with phase diagram.

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- 16 (a) Discuss the concept of trans esterification. Explain the properties and advantages of bio diesel.
(b) What are composites? Explain the advantages and applications of composite materials.
- 17 (a) Calculate the temporary, permanent and total hardness of a water sample having the following analysis. $\text{Ca}(\text{HCO})_3=162\text{mg/L}$, $\text{Mg}(\text{HCO})_3=\text{mg/L}$, $\text{MgCl}_2=95\text{mg/L}$, $\text{CaSO}_4=68\text{mg/L}$, $\text{CaCl}_2=50\text{mg/L}$, $\text{NaCl}=55.5\text{ mg/L}$ and $\text{MgSO}_4=12\text{ mg/L}$.
(b) Discuss the construction and working of Glass electrode.

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FACULTY OF ENGINEERING

B.E. I-Semester (CBCS) (Backlog) Examination, November 2021

Subject: Engineering Physics-I

Time: 2 hours

Max. Marks: 70

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

PART – A

Answer any five questions.

(5x2 = 10 Marks)

- 1 What do you mean by coherent sources?
- 2 Distinction between Fresnel and Fraunhofer diffraction.
- 3 Explain the importance LASER.
- 4 What is double refraction?
- 5 Write few applications of optical fiber.
- 6 State the properties of ultrasonics.
- 7 Define phase space.
- 8 Write Maxwell's equation in differential form.
- 9 Mention some of properties of wave function.
- 10 Explain basic principle of holography.

PART – B

Answer any four questions.

(4x15 = 60 Marks)

- 11 a) Explain the formation of interference fringes by means of Fresnel's biprism and derive the expression for fringe width.
b) Describe the diffraction of light at a single slit.
- 12 a) Explain the construction and working of Laurent's half shade Polari meter.
b) Describe the experimental method for operation of a Hi-Ne gas laser with energy level diagram.
- 13 a) Explain the double crucible method for fiber drawing process.
b) Discuss the Debye-sears method to determine wavelength of ultrasonics.
- 14 a) Derive an expression for Bose-Einstein statistics.
b) Distinguish micro canonical, canonical and grand canonical ensembles.
- 15 a) Derive the expression for wave function of a particle in an infinite square well potential.
b) Explain the conduction and displacement current.
- 16 a) Explain Einstein's coefficient of spontaneous and stimulated emission of radiation.
b) State and explain De Broglie's concept of matter waves.
- 17(a) Derive an expression for diameter of a dark ring by Newton's ring experiment.
(b) Write any four applications of holography.

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

Subject: Basic Electrical Engineering

Time: 2 Hours

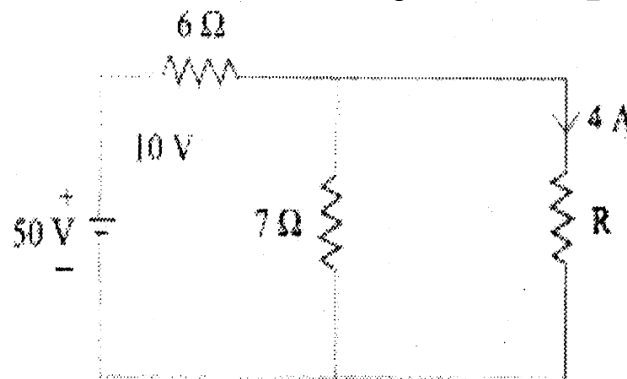
Max. Marks: 70

- 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.

(4 x 4 = 16 Marks)

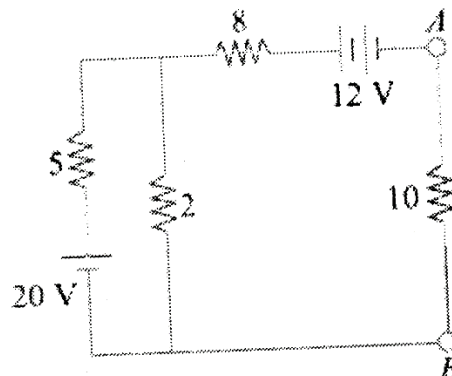
- 1 (a) Find the value of resistance 'R' shown in the given circuit.



- 2 (b) An alternating voltage is given by $v(t) = 100 \sin 314t$: find (i) average value (ii) instantaneous value at $t = 0.3$.
 (c) Name the losses in a transformer.
 (d) Why 1- ϕ induction motors are not self starting?
 (e) What is function of back EMF in dc motor? Under what conditions it would be zero.
 (f) An AC circuit takes a power of 14.2 kW at a power factor of 0.8 lagging. Find (i) apparent power and (ii) reactive power.
 (g) List out the disadvantages of low power factor.

(3 x 18 = 54 Marks)

- 2 (a) State and explain Superposition theorem.
 (b) State Thevenin's theorem and for the circuit shown in below Fig, calculate the current in the 10 ohm resistance using Thevenin's theorem only.



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- 3 (a) Show that $I_L = \sqrt{3}I_{ph}$ in 3- ϕ balanced delta connected system with the help of phasor diagram.
(b) A coil of resistance 10Ω and inductance 0.1 H is connected in series with a 150-F capacitor across a 200-V , 50-Hz supply. Calculate (i) the inductive reactance, (ii) the capacitive reactance, (iii) the impedance (iv) the current, (v) the power factor (vi) the voltage across the coil and the capacitor respectively.
- 4 (a) Explain generation of rotating magnetic field is produced in 3-phase induction motor.
(b) Derive the emf equation of 1- ϕ transformer.
- 5 (a) Explain in detail constructional details and principle of operation D.C generator.
(b) Explain capacitor run motor, Capacitor start motor with help of neat circuit diagram and mention its application.
- 6 (a) Write short notes on the following:
(i) Switch Fuse Unit (SFU) (ii) MCB (iii) ELCB (iv) MCCB.
(b) What is earthing? Explain the different types of earthing.
- 7 (a) Explain principle of operation of a D.C generator and derive the EMF equation of generator.
(b) A balanced star-connected load of $(8+j6) \Omega$ per phase is connected to a balanced 3-phase 400-V supply. Find the line current, power factor, power and total volt-amperes.

FACULTY OF ENGINEERING

B.E. (AICTE) I-Semester (Backlog) Examination, November 2021

Subject : Basic Electrical Engineering

Time: 2 Hours

Max marks: 70

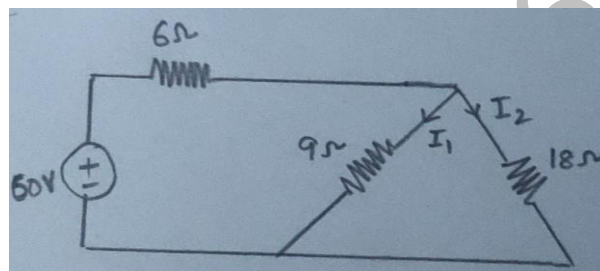
Missing data, if any, may be suitably assumed

PART – A

Note: Answer any Five questions.

(5x2=10 Marks)

1. State Thevinin's Theorem?
2. Find I_1 & I_2 ?



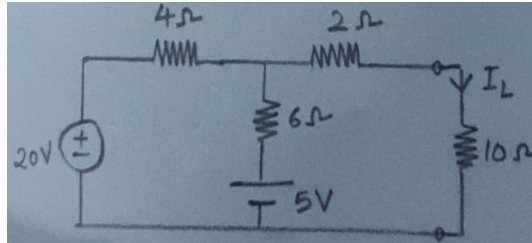
3. Draw the power triangle for lagging p.f. and leading p.f.?
4. Compare the relation between voltage & current in (i) pure resistive (ii) pure inductive (iii) pure capacitive circuits?
5. Why Transformer rating is in kVA?
6. What is the purpose of conducting OC test & SC test on 1 - ϕ transformer?
7. Draw the open circuit characteristics of DC separately excited generator and explain.
8. Define slip? What is the condition of 3 - ϕ induction motor when slip is 0 or 1?
9. List the types of Cables?
10. Calculate the total cost of energy consumption for given loads?
 Load : 10kW (geyser), Load2: 6kW (electric furnace), Load 3: 500W (five 100w bulbs) Total time taken : 15 hrs and consider each unit is 2.5/-

PART- B

Note: Answer any four questions.

(4x15 = 60 Marks)

11. a) State Super Position Theorem? What are the conditions needed for the circuits to apply super position theorem?
 b) Find the current through 10Ω resistor using Norton's Theorem?



12. a) A 100 V, 1 – ϕ 50Hz AC supply is applied across series connection of $R = 12\Omega$, $L = 0.15H$, $C = 100\mu F$. Calculate (i) Total Reactance (ii) Impedance (iii) Total Current (iv) Power factor (v) V_r , V_L , V_c ?
 b) Derive the Average value of a current for sinusoidal waveform.
- 13a) Explain the Principle & Operation of 1 – ϕ transformer?
 b) Draw the different connections of 3 – ϕ transformer?
14. a) A 4-pole, 500V DC shunt motor has 720 wave connected conductors in the armature. The full load armature current is 60A and the flux per pole is 0.03 wb. The armature resistance is 0.2Ω Calculate the full load speed of the motor?
 b) Explain the Losses in DC Machine?
15. a) What are the types of Wires and Explain what specifications of wires needed for domestic wiring?
 b) What is MCB? What are the parts of MCB? Also explain its operation?
16. a) Show that $V_L = \sqrt{3} V_{ph}$ in 3- ϕ balanced star connected system with the help of phasor diagram?
 b) Classify and Explain Network Sources?
17. a) Explain Losses in the 1- ϕ transformer?
 b) How to make 1- ϕ induction motor self starting? And explain any one type of 1- ϕ induction motor with neat diagram?
