1E3101

Roll No. _____ Total No. of Pages: 4

1E3101

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY2-01 Engineering Mathematics - I

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Evaluate - $\int_0^1 x^2(1-x)^3 dx$

Q.2 Test the convergence of $\int_1^\infty \frac{dx}{x^{3/2}}$.

Q.3 What is Convergence and Divergence of a sequence?

Q.4 Find the interval of convergence of Exponential and Logarithmic series.

Q.5 Write Euler's formula of Fourier Series.

Q.6 Find half range sine series for the function $f(x) = x$ in the interval $0 < x < z$.

Q.7 If $u = e^{xyz}$, then find $\frac{\partial^3 u}{\partial x\, \partial y\, \partial z}$.

Q.8 Write the equation of the tangent plane to the surface $z = f(x, y)$.

Q.9 Change the order of integration and then evaluate - $\int_0^1 \int_{x^2}^{2-x} xy\, dx\, dy$.

Q.10 Write the statement of Green theorem.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Show that $\int_0^\infty \frac{x^2\, dx}{(1+x^4)^3} = \frac{5\pi\sqrt{2}}{128}$.

Q.2 Test for convergence of the series $\sum \frac{1}{\sqrt{n} + \sqrt{n+1}}$.

Q.3 Find the Fourier series to represent $f(x) = |x|$ for $-\pi < x < \pi$.

Q.4 Find the directional derivative of $\phi = x^2 - 2y^2 + 4z^2$ at $(1, 1, -1)$ in the direction of the vector $2\hat{i} + \hat{j} - \hat{k}$. Also find the direction of maximum directional derivative at $(1, 1, -1)$ and its max value.

Q.5 Find the limit and test for continuity of the function

$$f(x, y) = \begin{cases} \frac{x^3 - y^3}{x + y} & \text{if} \quad x + y \neq 0 \\ 0 & \text{if} \quad x + y = 0 \end{cases} \text{ at the point } (0, 0).$$

Q.6 Evaluate $\iint_R (x^2 + y^2)\, dx\, dy$ where R is the region bounded by $y = x$ and $y^2 = 4x$.

Q.7 Evaluate $\iiint_V f dV$ where $f = 2x + y$, V is the closed region bounded by the cylinder $z = 4 - x^2$ and the plane $x = y = z = 0$ and $y = z$.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Find the Fourier Series to represent $f(x) = x - x^2$ in the interval $-1 < x < 1$.

Q.2 Test the convergence of the series $\frac{1^2}{2^2} + \frac{1^2.3^2}{2^2.4^2} + \frac{1^2.3^2.5^2}{2^2.4^2.6^2} + \ldots\ldots\ldots$

Q.3 If $u = f(r)$, $r^2 = x^2 + y^2$ show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$.

Q.4 Find the volume of greatest rectangular parallelepiped inscribed in the ellipsoid whose equation is $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

Q.5 Verify Stokes theorem for $F = (x^2 + y - 4)\,\hat{i} + 3xy\,\hat{j} + (2xz + z^2)\hat{k}$ over the surface of the hemisphere $x^2 + y^2 + z^2 = 16$ above the xy plane.

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1E3102

Roll No. _____ Total No. of Pages: 4

1E3102

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY2-02 Engineering Physics

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Why are Newton's Rings known as fringes of equal thickness?

Q.2 Why are two lenses used in Fraunhofer diffraction?

Q.3 What is Schrodinger equation?

Q.4 How are coherent waves generated?

Q.5 What is the theory of optical fibre?

Q.6 What are metastable states?

Q.7 Why semiconductor diodes are non-ohmic?

Q.8 Why are bonds formed in solids?

Q.9 What is the basic principle of electro-magnetic wave theory?

Q.10 Why do we need gradient, divergence and curl?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 What will be the radius of n^{th} order dark ring in case of -

(i) When a plano convex lens of radius of curvature R_1 is placed on a plano concave lens of radius of curvature R_2.

(ii) When both the plano convex surfaces are in contact at a point.

Q.2 A diffraction grating has a resolving power $\frac{\lambda}{\Delta\lambda} = Nn$. Show that the corresponding frequency range $\Delta\nu$ that can be just resolved is given by $\Delta\nu = \frac{c}{Nn\lambda}$

Q.3 Derive the Schrodinger time dependent equation and discuss the physical meaning of Ψ and Ψ^2.

Q.4 Find the core radius necessary for single mode operation at 800 nm in step index optical fibre with $\mu_{core} = 1.48$ and $\mu_{cladding} = 1.47$. Also find the numerical aperture and maximum acceptance angle.

Q.5 The resistivity of an intrinsic semiconductor is 4.5 ohm-meter at 20°C and 2.0 ohm-meter at 32°C. What is the energy band gap?

Q.6 Show that the energy density and Poynting vector of electromagnetic field are given by $U_{em} = \frac{1}{2}(\varepsilon_0 E^2 + \mu_0 H^2)$ and $S = E \times H$ where symbols have their usual meaning.

Q.7 A LASER beam of wavelength 692.8 nm and aperture 10×10^{-3} m from He-Ne LASER can be focused on an area equal to the square of its wavelength. If LASER source radiates energy at the rate of 20 mw.

Find-(a) angular spread of the beam

(b) Intensity of focused beam

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Discuss Fraunhofer diffraction due to N slits and derive the conditions of Principal maxima and minima. Show that secondary maxima are invisible in this case.

Q.2 What do you mean by degeneracy? Solve Schrodinger equation for a particle confined in 3-dimensional box and get the wave function and energy values.

Q.3 (a) Discuss the spontaneous and stimulated emissions and derive the relation between Einstein's Coefficients and discus the result.

(b) What do you mean by-

(i) Population inversion

(ii) Pumping

Q.4 What is Maxwell's EM theory? Derive the Maxwell's equations and show that Maxwell's EM wave truly represents light.

Q.5 Write a short note on -

(i) Band theory of solids

(ii) Conductivity in semiconductors and determination of band gap in a semiconductor

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1E3103

Roll No. _____ Total No. of Pages: 4

1E3103

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY2-03 Engineering Chemistry

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Provide the various units of expressing Hardness of water and write the equation representing their inter-conversion.

Q.2 Explain about Break-point-chlorination.

Q.3 Provide the Dulong's formula for the calculation of calorific value of a fuel using GCV & NCV.

Q.4 What is meant by combustion of fuels? Mention also about the combustible and non-combustible constituents of fuels.

Q.5 What do you understand by Galvanic series? How it differs from Electro chemical series?

Q.6 Describe in brief about Tinning.

Q.7 Explain the role of Gypsum in Cement.

Q.8 What are Viscosity and Viscosity Index of Lubricant oils?

Q.9 Provide the Mechanism of Electrophilic aromatic substitution by an example.

Q.10 Draw the structural formula for Aspirin and Paracetamol & their uses.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Calculate temporary, permanent and total hardness of one liter of water with following impurities -

$Mg(HCO_3)$ = 0.0246 gms; $Ca(HCO_3)_2$ = 0.0159 gms, $CaSO_4$ = 0.0168 gms, NaCL = 0.0069gm; and $MgSO_4$ = 0.0057 gms.

Q.2 Describe the process of Refining of Petroleum with labelled diagram of different fractions.

Q.3 Write a short note on -

(a) Anti-knocking agents

(b) Cetane number

Q.4 Explain the method to determine the calorific value of gaseous fuels by Junker's Calorimeter.

Q.5 Describe the types of Dry or Chemical corrosion.

Q.6 Provide the composition of Portland cement and it's manufacturing process.

Q.7 Write short notes on -

(a) Dehydration of Alcohols

(b) Free radical Rearrangements

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain following -

(a) Scale & Sludge formation **[4]**

(b) Boiler corrosion **[3]**

(c) Water softening by Zeolites **[3]**

Q.2 Describe the method to determine the calorific value of solid fuels by Bomb Calorimeter and compare the properties of solid fuels with liquid fuels.

Q.3 Write short notes on following - [4+3+3=10]

(a) Pitting corrosion & Concentration corrosion

(b) Galvanizing

(c) Sacrificial Anodic Protection

Q.4 Explain in details -

(a) Types & properties of Glass [5]

(b) Classification of Lubricants [5]

Q.5 Explain following - [5+5=10]

(a) Free radical Halogenation

(b) Nucleophilic addition in Aldehydes & Ketones

1E3104

Roll No. _____ Total No. of Pages: 4

1E3104

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY1-04 Communication Skills

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Give one example of verbal communication and one example of non-verbal communication.

Q.2 Name two barriers to effective communication.

Q.3 How do modal verbs differ from regular verbs?

Q.4 Give an example of a conditional sentence.

Q.5 What is a curriculum vitae (CV)?

Q.6 What is paragraph writing?

Q.7 Give suitable definition for a short story.

Q.8 Give an example of a moral lesson from "How Much Land Does a Man Need?"

Q.9 How are the themes of "No Men are Foreign" and "Where the Mind is Without Fear" similar?

Q.10 What is the central idea of "If" by Rudyard Kipling?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Describe the qualities that characterize good communication.

Q.2 Describe the different types of conditional sentences and provide examples of each type.

Q.3 Prepare a detailed CV for an individual with five years of experience in the IT industry. Include sections on technical skills, projects and professional development.

Q.4 Write a paragraph about the importance of maintaining a healthy diet. Include reasons and examples to support your points. (120-150 words)

Q.5 Summarize the plot of "Luncheon" by Somerset Maugham.

Q.6 Discuss the advice given in "If" by Rudyard Kipling. How can the poem's guidance be applied to personal and professional life?

Q.7 Discuss the significance of the title "No Men are Foreign." How does the title relate to the poem's message of global unity and peace?

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Discuss the types of communication giving examples of each type.

Q.2 Write a report on the Annual Science Fair. Include the purpose, event details (date, time, venue, participants), activities, highlights (special guests, award winners, notable projects), and conclusion (overall experience, feedback, recommendations).

Q.3 Choose the correct option -

(1) Which sentence is in the passive voice?
- (A) The manager approved the new policy.
- (B) The new policy was approved by the manager.
- (C) The manager is approving the new policy.
- (D) The manager has approved the new policy.

(2) Which of the following sentences is passive?
- (A) The chef cooked a delicious meal.
- (B) A delicious meal was cooked by the chef.
- (C) The chef is cooking a delicious meal.
- (D) The chef will cook a delicious meal.

(3) How would you report the statement -
"She said, 'I am going to the market.'"?
- (A) She said she is going to the market.
- (B) She said she was going to the market.
- (C) She said she will go to the market.
- (D) She said I am going to the market.

(4) How would you report the question -
"He asked, "Where are you going?"
- (A) He asked where am I going.
- (B) He asked where you are going.
- (C) He asked where was I going.
- (D) He asked where I was going.

(5) Which is an example of a first conditional sentence?
- (A) If it rains, I will stay home.
- (B) If it rained, I would stay home.
- (C) If it had rained, I would have stayed home.
- (D) If it rains, I stay home.

(6) Which sentence uses the second conditional?
  (A) If she studies, she will pass.
  (B) If she studied, she would pass.
  (C) If she had studied, she would have passed.
  (D) If she studies, she passes.

(7) Which sentence uses a modal verb to express ability?
  (A) She can swim very well.
  (B) She might swim very well.
  (C) She must swim very well.
  (D) She should swim very well.

(8) Which modal verb indicates a strong obligation?
  (A) She can finish the report.
  (B) She should finish the report.
  (C) She must finish the report.
  (D) She might finish the report.

(9) Which sentence correctly uses a conjunction?
  (A) She likes to read, but she doesn't like to write.
  (B) She likes to read, so she doesn't like to write.
  (C) She likes to read, because she doesn't like to write.
  (D) She likes to read, or she doesn't like to write.

(10) Which sentence uses a subordinating conjunction?
  (A) He waited until she arrived.
  (B) He waited and she arrived.
  (C) He waited or she arrived.
  (D) He waited so she arrived.

Q.4 Examine the narrator's emotions in "The Night Train at Deoli."

Q.5 Explain the significance of the phrase "where the mind is without fear."

1E3106

Roll No. _____

Total No. of Pages: 4

1E3106

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY3-06 Programming for Problem Solving

Time: 3 Hours

Maximum Marks: 70

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What are the difference between CPU & ALU?

Q.2 What is assembler?

Q.3 What is system software?

Q.4 What is application software?

Q.5 What are the functions of input unit?

Q.6 What is volatile & non-volatile memory?

Q.7 What is microprocessor?

Q.8 Define number system.

Q.9 What is primary memory?

Q.10 What is secondary memory?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain block diagram of computer and also explain the functioning of all its components.

Q.2 Explain the memory architecture of computer in details.

Q.3 Write a program in 'C' language using pointers that receives a floating-point number and sends back the integer and fraction parts.

Q.4 Write r's complements of the following numbers, where r is a radix (base) of these numbers with conversion -

(i) $(1056)_{16}$ to $(?)_8$

(ii) $(11672)_8$ to $(?)_{16}$

(iii) $(2724)_8$ to $(?)_5$

Q.5 Write a program of factorial number in 'C' language. Also write the flow chart and algorithm for this.

Q.6 Explain the concept of file handling. Also write a 'C' language program to copy the data from source file to destination file.

Q.7 Explain the operator precedence in expression evaluation of 'C' language with suitable example.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Write a program in 'C' language that takes a binary file of long integers and appends a new long integer at the end that is the sum of all integers in the original file.

Q.2 Explain the storage classes in 'C' language in detail.

Q.3 Explain the scope and lifetime of variables in 'C' functions. Explain them with suitable examples.

Q.4 Write a C program to print the following pattern -

A

B B

C C C

D D D D

E E E E E

Also write the flow chart for this.

Q.5 Considering two arrays, A and B, each containing 10 integers. Write a 'C' program that checks if every element of array A is equal to its corresponding element in array B. The program must accept only two pointer values and return a Boolean "true" for equal and "false" for unequal.

1E3107

Roll No. D016 Total No. of Pages: 2

1E3107

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY3-07 Basic Mechanical Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Explain the open and close system.

Q.2 What is the function of foot valve in suction pipe?

Q.3 Difference between belt drive and rope drive.

Q.4 State the use of piston rings in IC Engines.

Q.5 Define Ton of refrigeration.

Q.6 Define mechanical energy and thermal energy.

Q.7 What are functioning difference between refrigeration and air conditioning system?

Q.8 Write the comparison between SI and CI engine.

Q.9 What is mechanical coupling?

Q.10 What is pump?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Write name of various types of power plants and explain any one in detail.

Q.2 Explain the working of 4-stroke diesel engine.

Q.3 Describe the construction and working of vapour absorption refrigeration system.

Q.4 Describe the metal casting process with suitable diagrams.

Q.5 Explain construction and working of a typical centrifugal pump with a sketch.

Q.6 Write the classification of engineering materials.

Q.7 Derive the expression for the length of belt for close belt drive.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 (a) Define heat treatment. Explain different stages of heat treatment with suitable diagram.

(b) Explain various types of engineering material's properties.

Q.2 Explain the following processes in details -

(i) Forging

(ii) Rolling

(iii) Drawing

(iv) Extrusion

Q.3 (a) Belt runs over a pulley of 800 mm diameter at the speed of 180 rpm, the angle of lap is 165° degree and the maximum tension in the belt is 2KN. Determine the power transmitted if the coefficient of friction between the belt and pulley is 0.3.

(b) Write the comparison between SI and CI engine.

(c) How do you classify steam generator? Explain with example.

Q.4 Write the classification of gear drives. Derive an expression for the tension ratio of belt tensions on the tight and slack side for flat and V-belt passing over a pulley in terms of coefficient of friction and angle of contact of belt over pulley.

Q.5 Explain the joining processes of soldering, brazing and welding. Clearly bring out the differences between them and give specific applications of each type.

1E3108

Roll No. _____ Total No. of Pages: 4

1E3108

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY3-08 Basic Electrical Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define apparent power and power factor.

Q.2 Write the EMF equation of a transformer and define each term.

Q.3 If the length a wire of resistance R is uniformly stretched to n times its original value, then what is the value of its new resistance?

Q.4 Name and state the principle on which transformer works.

Q.5 State the torque-slip characteristic of an Induction motor.

Q.6 Write the full form of MCB. Where it is used?

Q.7 What is the significance of reactive power?

Q.8 What do you understand by lamination in a transformer?

Q.9 Distinguish between a rectifier and an inverter.

Q.10 What are the transformer losses?

PART – B

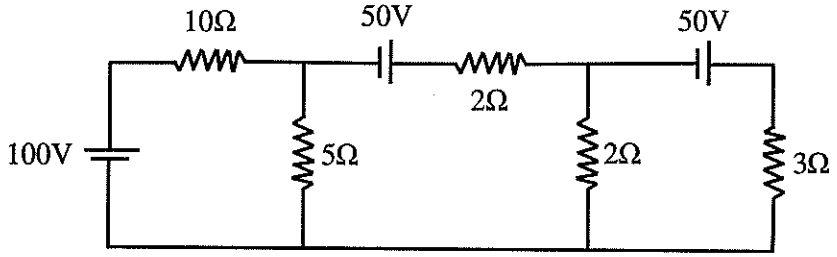
[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Determine the power factor of a RLC series circuit with R = 5 ohms, X_L = 8 ohms, and X_C = 12 ohms.

Q.2 Find the current through 5 ohm resistance using Thevenin's theorem in following circuit:



Q.3 With a neat circuit diagram explain the construction and operating principle of a DC machine.

Q.4 Derive EMF equation of a single phase transformer. Discuss why transformer is known as constant flux device.

Q.5 Explain the structure of NPN and PNP transistors in detail.

Q.6 Write a short note on commutators.

Q.7 Explain star to delta and delta to star transformation.

PART – C

[3×10=30]

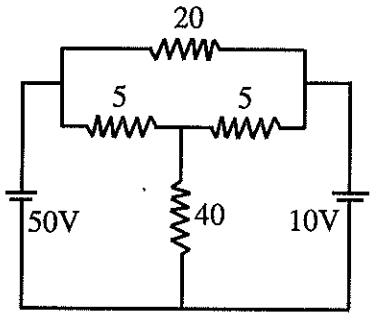
(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain with sketches the constructional features and working of a synchronous generator.

Q.2 A 100 ohms resistance is connected in series with a choke coil. On applying a 400 V, 50 Hz supply to this combination, the voltage across resistance and choke coil are 200 V and 300 V respectively. Find the power consumed by the choke coil. Also calculate the power of a choke coil and the power factor of circuit.

Q.3 Use superposition theorem to find the current in 40 ohms resistance in the circuit shown below (assume all resistances in ohms) :



Q.4 Explain why protective devices are used for overload and short circuit protection. Also explain why do we use an ELCB in electrical circuit installation?

Q.5 The load of a household consists of 8 lamps of 20W each, 4 fans of 75W each, 1 T.V. of 40W, 1 refrigerator of 150W, 1 AC of 1.5 kW, 1 heater of 1.8 kW, and 1 washing machine of 900W. If the supply is 230 Volts and fixed monthly meter charges are ₹ 150. Then for average loading of 50% throughout a day, what will be the electricity bill? Assume the cost per unit for first 800 units be ₹ 4, next 500 units be ₹ 5 and after that ₹ 6 per unit.

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1E3109

Roll No. _____ Total No. of Pages: 4

1E3109

B. Tech. I - Sem. (Main / Back) Exam., - 2025

1FY3-09 Basic Civil Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What are the various types of building plans?

Q.2 Define bearing capacity of soil.

Q.3 "Orientation is an essential step while planning a building". Comment.

Q.4 Define plinth area, floor area and carpet area.

Q.5 Explain the fundamental principles of surveying.

Q.6 What are the advantages of 'total station'?

Q.7 What do you mean by 'Ozone layer depletion'?

Q.8 Describe different kinds of chains used for linear measurements.

Q.9 Define Building Byelaws.

Q.10 What are the various modes of transportation?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Draw any five traffic signs and explain the meaning of each in detail.

Q.2 What are the various components of building? Explain in detail using neat and clean diagram.

Q.3 Discuss in brief various sources of water.

Q.4 Explain in brief various methods of disinfection.

Q.5 What are the sources of errors in compass survey and what precautions will you take to eliminate them?

Q.6 Describe the 'height of instrument' and 'rise and fall' methods of computing the levels.

Q.7 Write a note on wastewater treatment system.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain the hydrological cycle and the ill effects of environmental pollution on the hydrological cycle.

Q.2 Describe with a neat sketch various components of a residential building and their functions.

Q.3 Describe in detail how you would proceed in the field for -

(i) Profile levelling

(ii) Cross – Sectioning

Q.4 Write short notes on the following –

(a) Screening

(b) Sedimentation

(c) Filtration

(d) Unit operation

Q.5 The following are bearings taken on a closed compass traverse –

Side	Fore bearing	Back bearing
AB	80° 10'	259° 0'
BC	120° 20'	310° 50'
CD	170° 50'	350° 50'
DE	230° 10'	49° 30'
EA	310° 20'	130° 15'

Compute the interior angles and correct them for observational errors.

DO NOT WRITE ANYTHING HERE

1E2401

Roll No. _____ Total No. of Pages: 4

1E2401

B. Tech. I - Sem. (Back) Exam., - 2025

BSC

1FY2 – 01 Engineering Mathematics - I

Time: 3 Hours **Maximum Marks: 160**

Min. Passing Marks: 56

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×3=30]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define Beta and Gamma functions.

Q.2 Write the formula of volume of solid of revolution in Cartesian and polar coordinate system.

Q.3 Find the limit of the sequence $\langle x_n \rangle$, where

$$x_n = \frac{2n-7}{3n+4}$$

Q.4 What is D'Alembert's ratio test?

Q.5 Define Fourier series.

Q.6 Determine a_0, when $f(x) = x + x^2$, $-\pi < x < \pi$

Q.7 What is continuity?

Q.8 What is sufficient conditions for maxima and minima of functions of two variables?

Q.9 Evaluate $\int_0^1 \int_0^{1-x} xy \, dx \, dy$

Q.10 State Gauss's divergence theorem.

PART – B

[5×10=50]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Show that the following series is convergent –

$$\frac{1}{4} + \frac{1}{4^2} + \frac{1}{4^3} + \cdots + \frac{1}{4^n} + \cdots$$

Q.2 Find the Fourier series for the function –

$f(x) = x$, $-\pi < x < \pi$

Q.3 Evaluate - $\int_0^2 x^4 (4 - x^2)^{\frac{1}{2}} \, dx$

Q.4 Find the surface area of the solid generated by the revolution of the astroid $x = a\cos^3 t$, $y = a\sin^3 t$ about the x – axis.

Q.5 Evaluate - $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} \, dx \, dy$

by changing the order of integration.

Q.6 Evaluate - $\int_{-a}^{a} \int_{-b}^{b} \int_{-c}^{c} (x^2 + y^2 + z^2) \, dx \, dy \, dz$

Q.7 Find div f and curl f at the pt. (1, - 1, 1) for

$f = x\hat{i} + (x + y)\hat{j} + (x + y + z)\hat{k}$

PART – C

[4×20=80]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 Obtain the half range cosine series of

$$f(x) = \sin x$$

in the interval $0 < x < \pi$

Q.2 Find the equations of the tangent plane and the normal to the surface –

$$z^2 = 4\,(1 + x^2 + y^2) \text{ at } (2, 2, 6)$$

Q.3 If $\vec{r} = x\,\hat{i} + y\,\hat{j} + z\,\hat{k}$ and $r = |\vec{r}|$; prove that : div $r^n\,\vec{r} = (n + 3)r^n$

Hence show that $r^n\,\vec{r}$ will be solenoidal if n = -3

Q.4 Using Stoke's theorem, evaluate: $\int_C (xy\,dx + xy^2\,dy)$, where C is the square in the xy – plane with vertices respectively:

(1, 0), (-1, 0), (0, 1) and (0, -1)

Q.5 Prove that -

$$B(m, n) = \frac{\lceil m \ \lceil n}{\lceil m+n}\quad (m > 0, n > 0)$$

DO NOT WRITE ANYTHING HERE

1E2201

Roll No. _____ Total No. of Pages: 2

1E2201

B. Tech. I - Sem. (Old Back) Exam., - 2025

MA – 101 Engineering Mathematics - I

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 28

Instructions to Candidates:

*Attempt any **five questions, out of seven questions** including Question No. **1 which is Compulsory.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

Q.1 Answer of each sub question will be given in about 25 words. [8×2=16]

(a) Find the asymptotes parallel to the axes for the following curve:

$$\frac{a^2}{x^2} + \frac{b^2}{y^2} = 1.$$

(b) Show that - $\lim_{(x, y)\to(0, 0)} \frac{2x - y}{x^2 + y^2}$ does not exist.

(c) If $z = x \log y$, then show that -

$$\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$$

(d) State the necessary and sufficient conditions for the minimum of a functions f (x, y).

(e) Evaluate: $\int_{x=3}^{4}\int_{y=1}^{2}(xy + e^x)\,dy\,dx$.

(f) Evaluate: $\Gamma\left(\frac{1}{4}\right)\Gamma\left(\frac{3}{4}\right)$

(g) If $\vec{F} = xy^2\hat{i} + 2x^2yz\hat{j} - 3yz^2\hat{k}$, find div $\vec{F}$ at the point (1, -1, 1).

(h) State the Gauss divergence theorem.

Q.2 Trace the curve $y(x^2 + a^2) = a^3$. [16]

Q.3 (a) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$. [8]

(b) Find the points where the function $x^3 + y^3 - 3axy$ has maximum or minimum value. [8]

Q.4 If $u = f(r)$, where $r^2 = x^2 + y^2$, then prove that - [16]

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r}f'(r).$$

Q.5 Use beta and gamma functions, to evaluate - [16]

(a) $\int_0^\infty \frac{x}{1+x^6}\,dx$. (b) $\int_0^1 \sqrt{\left(\frac{1-x}{x}\right)}\,dx$.

Q.6 Apply Green's theorem to evaluate $\int_C (x^2 = \cosh y)dx + (y + \sin x)dy$, where C is the rectangle with vertices (0, 0), (π, 0), (π, 1), (0, 1). [16]

Q.7 (a) Evaluate $\iint_R (x^2 + y^2)\,dxdy$, where R is bounded by $y = x$ and $y^2 = 4x$. [8]

(b) Evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2}\,dxdy$ by changing into polar coordinates. [8]

1E2402

Roll No. _____ Total No. of Pages: 4

1E2402

B. Tech. I - Sem. (Back) Exam., - 2025

BSC

1FY2 – 02 Engineering Physics

Time: 3 Hours **Maximum Marks: 160**

Min. Passing Marks: 56

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×3=30]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Distinguish between covalent and metallic bonding.

Q.2 State Biot-Savart Law and Faraday's Law.

Q.3 Write two applications of Laser in Science, Engineering and Medicine.

Q.4 The carrier concentration in n-type semiconductor 10^{19} per m^3. What is the value of Hall coefficient?

Q.5 If $\phi(x, y, z) = 3x^2y - y^3z^2$, find the value of grad$\phi$ at point $(1, -2, 1)$.

Q.6 Define spatial and temporal coherence.

Q.7 What is Matter wave? Explain.

Q.8 Distinguish between the Fresnel and the Fraunhofer classes of diffraction.

Q.9 Define wave-particle duality. Explain.

Q.10 Define Hall Effect and Hall coefficient.

PART – B

[5×10=50]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 In a Newton's ring experiment the diameter of 4^{th} and 12^{th} dark ring is 0.500cm and 0.800cm, respectively. Deduce the diameter of 20^{th} dark ring.

Q.2 A diffraction grating used at normal incidence gives a green line (5400Å) in a certain order superimposed on the violet line (4050Å) of the next higher order. If the angle of diffraction is 30°, how many lines per cm are there in the grating?

Q.3 Calculate the refractive index of core and cladding material of a fibre from the following data: NA = 0.22, $\Delta = (n_{core} - n_{clad}) / n_{core} = 0.012$, NA = numerical aperture, n_{core} and n_{clad} have usual meanings.

Q.4 Establish the relation between Einstein's coefficients.

Q.5 Explain Fermi-Dirac distribution function and Fermi energy.

Q.6 Find the lowest energy of an electron confirmed to move in one dimensional potential box of length 1Å.

Q.7 Show that the gradient of a scalar function at any point is directed normally to the surface in the scalar field over which the value of the scalar function is constant.

PART – C

[4×20=80]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 Write down Schrödinger wave equation for a particle in a box. Solve it to obtain Eigen functions and show that the Eigen values are discrete.

Q.2 Deduce an expression for the resolving power of a grating.

Q.3 What is Poynting vector? How is the Poynting Theorem derived from Maxwell equations? Explain Poynting Theorem?

Q.4 Discuss the formation of Newton's rings by (i) reflected light and (ii) transmitted light. Derive an expression for the diameter of n^{th} dark ring in reflected light.

Q.5 Describe the construction and working of a semiconductor laser.

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1E2003

Roll No. _____ Total No. of Pages: 2

1E2003

B. Tech. I - Sem. (Old Back) Exam., - 2025

103 (O) Engineering Physics - I

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 Explain the formation of Newton's rings in reflected light. Prove that the diameters of dark rings are proportional to the square root of natural numbers. [16]

OR

Q.1 Explain the working of Michelson interferometer. How circular fringes be produced with it? Show with necessary theory how it is used to find the wavelength of monochromatic light? [16]

UNIT- II

Q.2 What is polarized light? How will you distinguish plane polarized, circularly polarized and elliptically polarized light? [16]

OR

Q.2 Describe the construction and working of a Biquartz Polarimeter. How will you use it to determine the specific rotation of an optically active substance? [16]

UNIT- III

Q.3 Find out an expression for intensity at a point in the Fraunhofer diffraction due to single slit. Draw the intensity distribution curve. [16]

OR

Q.3 How does plane diffraction grating forms a spectrum? Show that grating spectrum is a normal spectrum. On which factors does the width of a spectral line depend? [16]

UNIT- IV

Q.4 Classify the elements as conductors, insulators and semiconductors on the basis of band theory of solids with suitable diagram. [16]

OR

Q.4 Show that Hall Effect is independent of the applied magnetic field and is inversely proportional to the current density and electronic charge. Mention the applications of Hall Effect. [16]

UNIT- V

Q.5 State the postulates of special theory of relativity and deduce from them the Lorentz Transformations. [16]

OR

Q.5 Using principles of special theory of relativity derive mass – energy relation. Illustrate it with an example. Also show that photon has rest mass zero. [16]

1E2403

Roll No. _____ Total No. of Pages: 2

1E2403

B. Tech. I - Sem. (Back) Exam., - 2025

BSC

1FY2 – 03 Engineering Chemistry

Time: 3 Hours **Maximum Marks: 160**

Min. Passing Marks: 56

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×3=30]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is carbonization of coal?

Q.2 Explain Break Point Chlorination.

Q.3 Why corrosion is much faster at joints?

Q.4 What are the uses of aspirin?

Q.5 Write down significance of flash and fire point of lubricant.

Q.6 What are electrophiles and nucleophiles? Explain with examples.

Q.7 State Pilling Bedworth rule in corrosion.

Q.8 What is Octane number?

Q.9 Why Gypsum is added in the cement?

Q.10 What are the units of hardness? State the relations between these units.

PART – B

[5×10=50]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the manufacturing of petrol by Fischer - Tropsch process with neat and labelled diagram.

Q.2 Discuss the importance of viscosity in lubricating oil. How viscosity is determined by R.W.Viscometer?

Q.3 Explain the Zeolite method of water softening in detail.

Q.4 Explain sacrificial anode protection method to minimize corrosion.

Q.5 What are nucleophilic substitution reactions? Give two examples.

Q.6 How annealing is important in manufacturing process of glass?

Q.7 What is knocking in the internal combustion engine? How are anti-knocking characteristics of a fuel improved?

PART – C

[4×20=80]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 What is corrosion? Explain 'Rusting of Iron' with the help of electrochemical theory of corrosion.

Q.2 What is drug? Describe the chemical synthesis, properties and uses of Paracetamol.

Q.3 (i) What is Hardness? Explain principle of EDTA method for hardness determination of water sample.

(ii) A sample of water has the following analysis -
$Mg(HCO_3)_2 = 14.6$ mg/L, $MgCl_2 = 19$ mg/L, $Mg(NO_3)_2 = 29.6$ mg/L, $CaCO_3 = 10$ mg/L, $MgSO_4 = 36$ mg/L, $NaCl = 60$ mg/L, $SiO_2 = 25$ mg/L. Calculate the temporary, permanent and total hardness of water sample in ppm.

Q.4 What is Portland cement? Describe the manufacturing of cement by Rotary Kiln Technology.

Q.5 (i) What is calorific value of solid fuel? Explain the working of Bomb Calorimeter with diagram, for determination of calorific value of fuel.

(ii) The ultimate analysis of coal gives -
C = 84%, S = 1.5%, H = 5.5%, O = 8.4% and rest is ash. Calculate the gross and net calorific values of the coal.

1E2005

Roll No. _____ Total No. of Pages: 4

1E2005

B. Tech. I - Sem. (Old Back) Exam., - 2025

105 (O) Basic Electrical and Electronics Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) State and Explain Thevenin's theorem. Illustrate the application of this theorem, with reference to an appropriate electric circuit. [8]

(b) Compute the power dissipated in 12Ω resistance of given Fig.1 by applying the superposition theorem. [8]

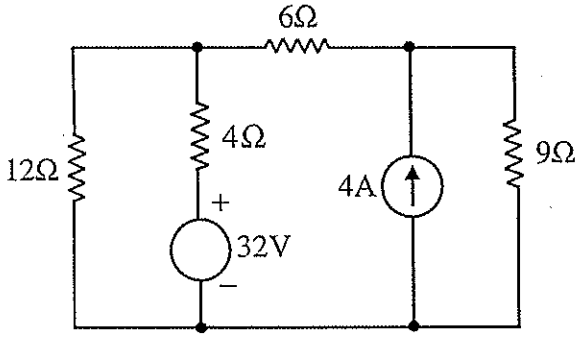

Fig.1

OR

Q.1 (a) Find the current through the 1Ω resistor using node voltage method for the circuit shown in Fig.2 [8]

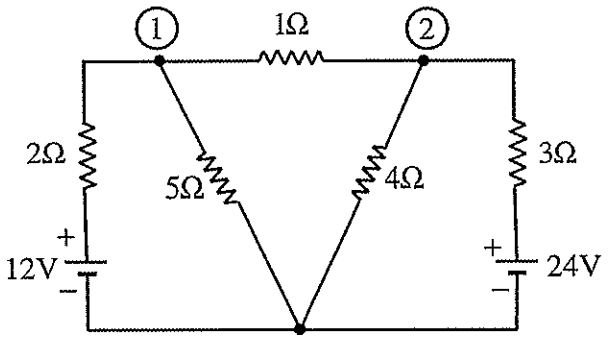

Fig.2

(b) State and explain Norton's theorem. Illustrate the application of this theorem, with reference to an appropriate electric circuit. [8]

UNIT- II

Q.2 (a) State and explain Form Factor, and Peak Factor with required formulas. [8]

(b) A sinusoidal alternating supply has an rms value of 100V and frequency of 50Hz and is connected to a series circuit having both resistance and inductance. The current taken from supply has a rms value of 5A and power taken is 250W. Calculate (i) Power factor of the circuit (ii) The peak value of current (iii) Apparent power (iv) Time taken for one complete cycle of supply. [8]

OR

Q.2 (a) What you mean by Peak, Average & RMS value of sinusoidal current. [8]

(b) A 5μF capacitor is connected in series with a variable inductor to a 20V, 796 Hz source. For what value of inductance will the current be (i) 2A lagging (ii) 2A leading? [8]

UNIT- III

Q.3 (a) A 4-pole machine running at 1500 rpm has an armature with 90 slots having 6 conductors per slot. The flux per pole is 6×10^{-2} Wb. Determine the induced EMF as a DC generator if the coils are lap-connected. If the current per conductor is 100 amperes, determine the electrical power output. [8]

(b) Explain the principle of operation of 3-phase induction motor. [8]

OR

Q.3 (a) Explain the principle of D.C. machines and the construction of D.C. machines. [8]

(b) Write short notes on the following - [8]

(i) Applications of DC machines

(ii) Applications of AC machines

UNIT- IV

Q.4 (a) Explain the input and output characteristics of BJT in common emitter configuration. [8]

(b) Realize the Ex-OR an Ex-NOR gates by using only NAND gates. [8]

OR

Q.4 Differentiate between the following - [16]

(i) Half wave and Full wave Rectifier

(ii) Zener breakdown and Avalanche breakdown

(iii) BJT with FET

(iv) Metal, semiconductor and insulators

UNIT- V

Q.5 (a) Explain the following - [8]

(i) RTD

(ii) Strain Gauges

(b) A sinusoidal carrier wave of frequency 2MHz and Amplitude 20mV is amplitude modulated by a sinusoidal wave of frequency 5kHz. Determine the frequency and amplitude of side bands. Consider modulation index as 0.8. [8]

OR

Q.5 Write short notes on any two - [16]

(i) Amplitude and frequency modulation schemes

(ii) Load cell and Bimetallic Strips

(iii) Classification of IC's
