

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RBC2B002

2nd Semester Back Examination: 2023-24

SUBJECT: Basic Civil Engineering

BRANCH(S): AE, AERO, CIVIL, CSE, CSEAI, CSEAIME,
CSEDS, CSIT, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL &
C.E, ETC, IT, MANUTECH, MECH, MINING, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: P522

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) State the importance of Civil Engineering.
- b) Write the standard size of bricks as per BIS.
- c) Name different components of a building.
- d) What is mortar? State different types of mortar.
- e) What is surveying?
- f) Define for bearing and back bearing of a line.
- g) What is foundation?
- h) What is Irrigation Engineering?
- i) State names of different hydraulic structures.
- j) Write the basic objective of traffic engineering.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Briefly explain about the broad disciplines of Civil Engineering.
- b) Enumerate the qualities of good bricks.
- c) Briefly explain about classification of stones.
- d) Define and briefly explain workability of concrete.
- e) Mention the properties of good mortar.
- f) When is chain survey recommended? Mention the principle of chain surveying.
- g) What is local attraction? How it is detected and adjusted?
- h) What is total station? State the fundamental quantities measured by a total station.
- i) Develop a typical layout of an irrigation canal system.
- j) Describe the classification of soil as per Indian standard.
- k) Write different advantages and disadvantages of irrigation.
- l) State the planning and design aspects of transportation engineering.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Enumerate the different laboratory tests for cement and describe any two of them in details. **(16)**

Q4 The following are the observed bearings of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected. **(16)**

Line	FB	BB
AB	191° 45'	13° 0'
BC	39° 30'	222° 30'
CD	22° 15'	200° 30'
DE	242° 45'	62° 45'
EA	330° 15'	147° 45'

At what stations do you suspect local attraction? Find the correct bearings of the lines also compute the included angles

Q5 Discuss various functions served by foundation. Explain different types of foundations with figures. **(16)**

Q6 a) State advantages and disadvantages of brick masonry over stone masonry. **(8x2)**
b) Explain about different modes of transport.

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23ES1001

2nd Semester Regular Examination: 2023-24

SUBJECT: Basic Electrical Engineering

BRANCH(S):

AE, AERO, AME, BIOMED, BIOTECH, C&EE, CHEM, CIVIL, CSE, CSEAI, CSEAIM, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MECH, METTA, MINING, PT

Time: 3 Hour

Max Marks: 100

Q.Code: P371

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

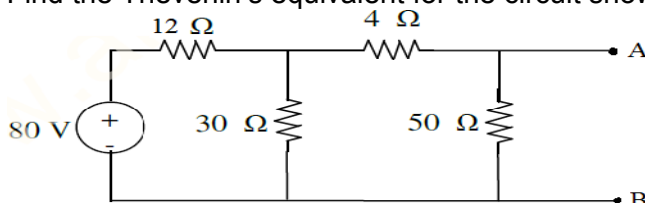
Q1 Answer the following questions: (2 x 10)

- What is a unilateral circuit? Explain.
- Total current leaving a junction is equal to the total current entering that junction is supported by which law? Justify your answer with reason.
- Write down the formula for a star connected network is converted into a delta network.
- An AC current is given by $i = 10\sqrt{2}\sin 314t$, calculate RMS and Average Values.
- For AC power, draw the Power triangle with proper labeling.
- State maximum power transfer theorem and give one example where this theorem is used.
- Write down the emf equation for DC generator and mention each term in the equation.
- Mention the limitations of the Thevenin's theorem.
- Mention the purpose of laminating the core of a transformer.
- A series R-L-C circuit has $R = 5\Omega$, $L = 0.15\text{mH}$, and $C = 100\mu\text{F}$ and is supplied with 230V, 50Hz single phase. Find impedance and current in the circuit.

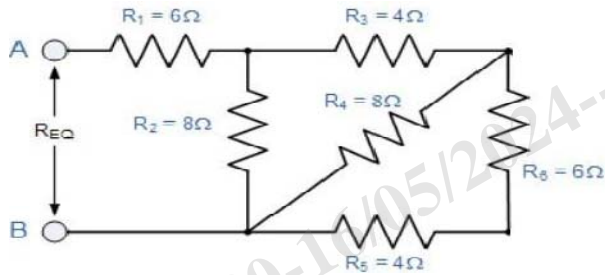
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- A resistance R is connected in series with a parallel circuit comprising two resistances of 12Ω and 8Ω respectively. The total power dissipated in the circuit is 70 W when the applied voltage is 20V. Calculate R .
- A three single phase balanced load connected in three phase three wires star form, with the help of phasor diagram, obtain the relationship between line and phase quantities of voltage and current.
- For the single-phase transformer, obtain an expression for EMF induced in either primary side or secondary side.
- Find the Thevenin's equivalent for the circuit shown below



- e) Find the equivalent resistance for the circuit shown below.

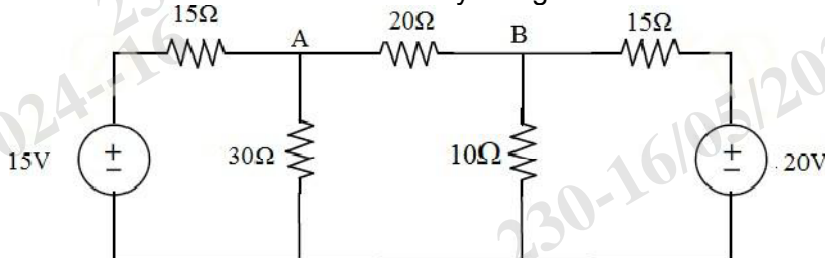


- f) How to control the speed of a D.C. Shunt motor. Explain it with one example.
- g) With neat sketch explain power system structure starting from generation to distribution.
- h) A single-phase transformer has 600 turns on primary winding 1200 turns on secondary winding. If it is operating at 50Hz supply with a maximum flux of 0.055Wb. Find: (I) Primary & Secondary induced EMF (II) EMF induced per turn.
- i) With the help of neat diagram, explain the constructional details of three phase induction motor.
- j) Explain the significance of slip in induction motor. What do you mean by slip speed?
- k) If a coil of 150 turns is linked with a flux of 0.01 Wb when carrying current of 10A, calculate the inductance of the coil. If this current is uniformly reversed in 0.01 second, calculate the induced electromotive force.
- l) Establish the relation between B and H. (B- Flux density, H- Magnetic field strength)

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** A three phase 400 V, 50 Hz supply is given to three phase induction motor with 4 pole and runs at 1440 rpm. Determine the speed of the rotor flux, frequency of the rotor current and slip. **(16)**
- Q4** a) Derive the expression for line voltage, phase voltage, line current, and phase current in both 3-phase star and delta connections. **(8+8)**
- b) Three phase power consumed by the balanced load is given by $P = \sqrt{3}V_L I_L \cos(\phi)$ watts, then show that two wattmeter are sufficient to measure three phase power P.
- Q5** a) Determine the current in branch A-B by using KVL for the below circuit. **(8+8)**



- b) Explain about Ideal and Practical Current and Voltage sources in detail.
- Q6** a) Calculate the r.m.s. value, the form factor, and peak factor of a periodic voltage having the following values for equal time intervals changing suddenly from one value to the next: 0, 5, 10, 20, 50, 60, 50, 20, 10, 5, 0, -5, -10 V etc. What would be the r.m.s value of sine wave having the same peak value? **(8+8)**
- b) With neat sketch give different types of DC motors.

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RBL2B002

2nd Semester Back Examination: 2023-24

SUBJECT: BASIC ELECTRONICS ENGINEERING

BRANCH(S): AE, AERO, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ETC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PLASTIC

Time: 3 Hour

Max Marks: 100

Q.Code : P374

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Draw the equivalent circuit diagram of a transistor.
- Draw V-I characteristics of the ideal diode.
- What are the applications of CC configuration of transistor?
- Define CMRR.
- Distinguish between BJT and FET.
- Draw the circuit diagram of an Op-amp differentiator.
- Write the characteristics of ideal op-amp.
- Draw logic gate symbols for NOR & NAND gates.
- Draw the NOR gate using NAND gates only.
- $(155)_{10} = (?)_8$ and $(101110)_2 = (?)_{16}$.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain the forward and reverse characteristics of a silicon diode.
- With respect to BJT, describe the concept of obtaining the DC load line.
- With a neat circuit diagram and waveforms explain the working of full wave bridge rectifier and find its ripple factor.
- Explain how a Zener diode can be used as voltage regulator by considering the no load and loaded condition.
- Explain the Enhancement type MOSFET along with the drain characteristics.
- Explain the working of an n-channel JFET.
- Design a circuit which produces the output voltage $V_0 = -(V_1 - 2V_2 + 3V_3)$ using Op-Amp with minimum resistance value 60K Ω .

- h) Describe the block diagram representation of an Op-Amp. Also describe its operational behavior with an equivalent circuit.
- i) Derive the output voltage of a differentiator circuit using Op-Amp.
- j) Design a half adder using NOR gates only.
- k) Design an EX-NOR gate using minimum number of NAND gates.
- l) Design Full Adder and Implement it using two half adders.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- | | | |
|-----------|--|-------------|
| Q3 | Explain various types of diodes, its constructional details, and input output characteristics. | (16) |
| Q4 | Explain in detail about various types of FETs, its constructional details, merits, and applications. | (16) |
| Q5 | Explain how Op-Amp can be used as i) Integrator ii) Inverting Summer and iii) Voltage Follower | (16) |
| Q6 | Design a half adder, full adder, half subtractor with NOR gates only. | (16) |

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and
M.Tech)

Sub_Code: RBM2B001

2nd Semester Back Examination: 2023-24

SUBJECT: Basic Mechanical Engineering

BRANCH(S):

AEIE,AUTO,CIVIL,CSE,CSEAI,CSEAIME,CSEDS,CST,ECE,EEE,ELECTRICAL,ELECTRICAL
& C.E,ETC,MECH,MINERAL,MME

Time: 3 Hour

Max Marks: 100

Q.Code: P524

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from
Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) Differentiate between intrinsic and extrinsic thermodynamic property with examples.
- b) Define entropy. Highlight its characteristics
- c) Describe different thermodynamic processes occurring in a Carnot cycle.
- d) Explain the term "enthalpy" in a thermodynamic system. How does it relate to the internal energy of a system?
- e) Describe third law of thermodynamics. How does it relate to absolute zero concept?
- f) Why are petrol engines termed as SI engine and diesel engines termed as CI engines?
- g) What are the primary components of a robot's anatomy?
- h) Define the terms: precision and accuracy in mechanical measurements.
- i) Mention the advantage of double-helical gear over single-helical gear.
- j) Distinguish between gas and vapor.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) State second law of thermodynamics. How does the second law of thermodynamics relate to the concept of entropy, and what role does it play in determining the direction of natural processes?
- b) Explain the significance of phase transitions in the behavior of pure substances, and how they relate to thermodynamic properties such as enthalpy and entropy?
- c) What is the function of brake? How does it differ from clutch? What are various types of clutches?
- d) What is the function of coupling? What are the requirements of a good coupling? How are the couplings classified?
- e) Define entropy. Discuss its characteristics. Describe principle of increase of entropy in a thermodynamically isolated system.
- f) Name the tools or instruments used for measurement of temperature, pressure, velocity, flow, and stress and strain in any complex mechanical systems. Also, explain the working principle of any two of these measuring devices.

- g) What are the primary methods of transmitting motion and power in mechanical systems? Discuss the function and importance of gears in power transmission systems.
- h) Describe the components and stages of the Rankine cycle used in power generation. Compare and contrast the Rankine cycle with Carnot cycle.
- i) Explain the significance of steady flow energy equation in engineering thermodynamics. Provide an example illustrating its application in real-world engineering scenarios. Discuss the assumptions made in deriving the steady flow energy equation.
- j) Define dryness fraction of steam. How do you estimate the dryness fraction of steam in a given system, and what are the key factors that influence it?
- k) A Carnot cycle operates between source and sink temperatures of 300°C and -20°C . If the system receives 100 kJ from the source, find: (I) Efficiency of the system, (II) The Net work transfer, and (III) Heat rejected to sink.
- l) Describe different types of belt drives with neat sketches. Explain the pros and cons of belt drives over rope drives.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) During process A, the system receives 20 kJ heat and produces 30 kJ work. The process B between same end conditions, receives 15 kJ heat. Determine the change in internal energy during the process and work done in process. Prove that if the cycle is formed using processes A and B, the given data confirms the first law of thermodynamics. **(8+8)**
- b) In air compressor air enters at 1.013 bar and 27°C having volume of 5 m^3 and it is compressed to 12 bar isothermally. Determine (I) work done, (II) heat transfer, (III) change in internal energy.
- Q4** a) Air at 12°C and 85 kPa enters the diffuser of jet engine steadily with a velocity of 220 m/s. The inlet area of the diffuser is 0.38 m^2 . The air leaves the diffuser at a negligible velocity compared to inlet velocity. Calculate (i) mass flow rate of air (ii) the temperature of air leaving the diffuser. **(8+8)**
- b) A lump of 800 kg of steel at 1250 K is to be cooled to 500 K. If it is desired to use steel as source of energy. Calculate available energy and unavailable energy. Consider specific heat of steel as 0.5 kJ/kg K and ambient temperature is 300 K.
- Q5** a) Explain the principle of operation and applications of a strain gauge-based load cell in mechanical measurements. Provide a detailed overview of the working mechanism, including the factors affecting its accuracy and sensitivity. **(8+8)**
- b) Explain the working principle, construction, and applications of a Bourdon tube pressure gauge in mechanical measurements.
- Q6** a) Describe the general applications and advantages of gear and belt drive systems. **(8+8)**
- b) Describe the anatomy of a typical industrial robotic arm and its components. How do these components work together to achieve precise and flexible movements?

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCH2A002

2nd Semester Back Examination: 2023-24

SUBJECT: CHEMISTRY

BRANCH(S):

AUTO,CIVIL,CSE,CSEAI,CSEAIME,CSSEDS,CSIT,CST,ECE,EEE,EIE,ELECTRICAL,ELECTRIC
AL & C.E,ETC,MANUTECH,MECH,MINING,PLASTIC

Time: 3 Hour

Max Marks: 100

Q.Code: P290

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- State Lambert Beer's Law.
- What is Gibb's phase rule?
- What is CNG? Mention some uses of CNG.
- What is cathodic protection?
- What are nanomaterials?
- What are chromophores?
- What are eutectic systems?
- What is synthetic petrol?
- What is differential aeration corrosion?
- What is top-down approach?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Write the basic concept and postulates of quantum mechanics.
- Discuss the principles and application of UV-Visible spectroscopy.
- Explain the effect of conjugation on chromophores with suitable examples.
- Explain the phase diagram of water system.
- Write a short note on cathodic protection.
- Write a short note on gaseous fuels.
- Write a short note on stress corrosion.
- Discuss some green synthetic routes for the synthesis of nanomaterials.
- Give a brief account on the application of nanomaterials in electronic devices and environmental fields.
- Discuss the classification of fuels.

- k) Write a short note on corrosion inhibitors.
l) Explain cracking, knocking, and anti-knocking.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Discuss the Lambert Beer's law and its application in UV visible spectroscopy. **(16)**
- Q4** What is condensed phase rule? Discuss the phase diagram of eutectic Bi-Cd system. **(16)**
- Q5** Define calorific value of fuel. Differentiate between H.C.V. and L.C.V. of the fuel. State and explain Dulong's formula for theoretical determination of calorific value of fuel. **(16)**
- Q6** Explain various approaches of nanomaterial synthesis. Give one method of synthesis of nanomaterials via green synthetic route. **(16)**

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23BS1003

2nd Semester Regular Examination: 2023-24

SUBJECT: Chemistry

BRANCH(S):

AEIE,AUTO,CE,CHEM,CIVIL,CSE,CSEAI,CSEAIME,CSEDS,CST,ECE,EEE,ELECTRICAL,ETC
,MANUTECH,MECH,METTA,MINING,MME,PLASTIC,PT,CE,CSE,ME

Time: 3 Hour

Max Marks: 100

Q.Code: P289

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

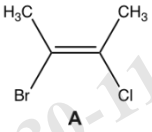
Q1 Answer the following questions: (2 x 10)

- What is penetration power? Compare the penetration power of different orbital with probability density plot.
- If the inter-nuclear distance between two chlorine atoms in a Cl_2 molecule is 198 pm, what is the covalent radius of chlorine?
- Calculate the entropy change when 5 moles of an ideal gas undergo isothermal expansion at 20°C from a pressure of 10 atm to a pressure of 2 atm.
- Define entropy. Write its physical significance.
- At definite wavelength, absorbers when placed in a cell of 1 cm pathlength absorb 20% of the incident light. If the absorptivity of the absorber at this wavelength is 2. Find out its concentration.
- What is the main criterion for a molecule to Microwave active? Which of the following molecules will show a microwave rotational spectrum?
 CH_3Cl and CO_2 .
- What is racemic mixture? Mention about its optical activity.
- Which conformer of cyclohexane (chair/boat) is more stable and why?
- Justify the stability order Triphenylmethyl > Benzyl > Allyl
- Write the addition product of $\text{CH}_3\text{CH}=\text{CH}_2$ with HBr in presence and absence of an organic peroxide. Justify your answer.

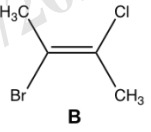
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What is electronegativity? Discuss the different scale to express the electronegativity of element.
- State Fajan's rule. How does the charge and size of cation and anion affect polarization and covalent character? What are the limitations of Fajan's rules in predicting covalent character?
- Discuss the basic principles of UV-Visible spectroscopy with a description of different types of electronic transition.
- Discuss the factors influencing the rate of nucleophilic substitution reactions.

- e) I. What happens to the entropy when two ideal gases are mixed with each other? Derive the expression for entropy of mixing.
 II. 1 mole of H_2 and 9 moles of N_2 are mixed at 298 K and 1 atmosphere. Assuming the ideal behavior of the gas, calculate the entropy of mixing per mole of the mixture formed.
- f) Derive Claypeyron–Clausius Equation? How does it help in solid-gas explaining the liquid – vapor equilibrium?
- g) Define chromophore and auxochrome? Give examples. Discuss the different effects pertaining to the shift of intensity and wavelength due to auxochrome.
- h) Write the basic principle of IR spectroscopy and write the expression for vibrational frequency. Discuss about the different types of vibrations.
- i) Define and discuss geometrical isomerism with example. Write the conditions required for showing this type of isomerism. Assign E and Z nomenclature to the following compounds.
- 

A



B
- j) Discuss the different optical isomers of tartaric acid giving a brief discussion on the different terms like enantiomers, diastereomers, meso, and racemic isomers.
- k) Define free radicals. Give examples. Discuss the structure, any two methods of generation and stability of free radicals.
- l) Why aromatic hydrocarbons resistant to addition reactions but can be undergoing substitution reactions? Discuss the Friedel craft's reactions with mechanism.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** What is meant by periodicity in properties of element? Name the properties showing periodicity in the periodic table. Define the ionization energy and successive ionization energy. Discuss the different factors affecting the ionization energy. Also discuss the trends in ionization energy across the period and group. (16)
- Q4** a) Write the principle of Microwave spectroscopy. Derive the expression for radius of a diatomic molecule using the application of microwave spectroscopy. (8x2)
 b) Write the expression for the energy corresponds rotational lines and also find the energy of transition across the different rotational levels. The separation of lines in the microwave spectrum of CO molecules was found to be 298 m^{-1} . Calculate the rotational constant, bond length of the molecule and the energy corresponding to first excited state energy level.
- Q5** What are nucleophilic substitution reactions, and give examples of such reactions? Describe the mechanism of nucleophilic substitution reactions in detail. Discuss the stereochemistry involved in nucleophilic substitution reactions. (16)
- Q6** a) Define free energy. How does it vary with temperature and pressure? (8x2)
 b) Derive the expression for free energy change of an ideal gas. One mole of an ideal gas at 27°C expands isothermally and reversibly from initial volume of 2 dm^3 to a final volume of 20 dm^3 against a pressure that is gradually reduced. Calculate q , w , ΔE , ΔH , ΔA , ΔG , and ΔS .

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

23ES1004

2nd Semester Regular Examination: 2023-24

SUBJECT: Engineering Mechanics

BRANCH(S):

AEIE,AUTO,BIOMED,BIOTECH,CE,CHEM,CIVIL,CSE,CSEAI,CSEAIMC,CSEDS,CST,ECE,
EEE,ELECTRICAL,ETC,MANUTECH,MECH,METTA,MINING,MME,PLASTIC,PT

Time: 3 Hour

Max Marks: 100

Q.Code: P467

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- State the Lami's theorem.
- Two forces of 100 N and 150 N are acting simultaneously at a point. What is the resultant of these two forces, if the angle between them is 45° ?
- State the Varignon's principle of moments.
- Name the methods, which are employed, for finding out the forces in a truss.
- Define coefficient of friction and limiting friction.
- Find the moment of inertia of a rectangular section 30 mm wide and 40 mm deep about X - X axis and Y - Y axis.
- State the first theorem of Pappus.
- State the D'Alembert's principle.
- Define the term 'conservation of energy'.
- Distinguish between the linear velocity of a point on a body rotating about a fixed axis and its angular velocity. Write the relation between them.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Distinguish between resolution of forces and composition of forces with examples.
- Explain the advantages of drawing a free-body diagram with suitable example.
- What do you understand by the term friction? State the laws of friction.
- A load of 300 N is lying on an inclined plane, whose inclination with the horizontal is 30° . If the coefficient of friction between the load and the plane is 0.3, find the minimum and maximum horizontal force, which will keep the load in equilibrium.
- State and prove the theorem of perpendicular axis applied to moment of inertia.
- A body is projected upwards with a velocity of 30 m/s. Find (i) the time when its velocity will be 5 m/s, and (ii) the time when it will be 20 meters above the point of projection.
- Obtain an equation for the trajectory of a projectile, and show that it is a parabola.

- h) From a circular area of diameter '2d', a smaller circle of diameter 'd' is removed as shown in Fig. 1. Locate the centroid of the remaining area.

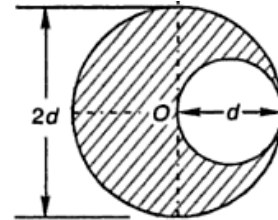


Fig. 1

- i) An aircraft, moving horizontally at 108 km/hr at an altitude of 1000 m towards a target on the ground, releases a bomb which hits it. Estimate the horizontal distance of the aircraft from the target, when it released the bomb. Calculate also the direction and velocity with which the bomb hits the target. Neglect air friction.
- j) A motor cycle starts from rest and moves with a constant acceleration of 2.25 m/s^2 . What is its angular acceleration, if the diameter of the motor cycle wheels is 750 mm?
- k) What do you understand by the term kinematics? Explain different types of plane motion of rigid bodies with suitable examples.
- l) Define the following terms:
(i) Work, (ii) Impulse, and (iii) Coefficient of restitution

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3

Fig. 2 shows a truss consisting of seven members each of 3 m length freely supported at its end points. The truss is loaded at B and C as shown. Find the forces in all the members of the truss, indicating whether the force is compressive or tensile.

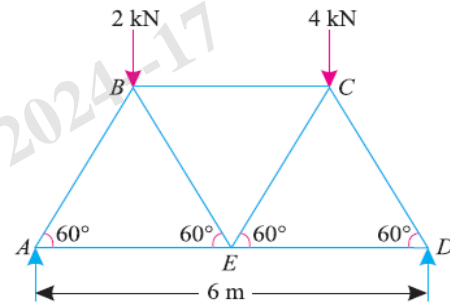


Fig. 2

(16)

Q4

Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in Fig. 3. If the coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force (P) required moving the block B.

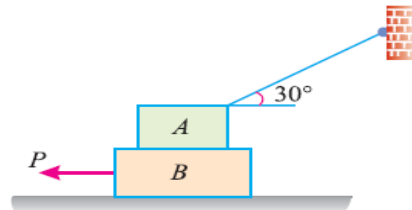


Fig. 3

(16)

Q5

An I-section is made up of three rectangles as shown in Fig. 4. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.

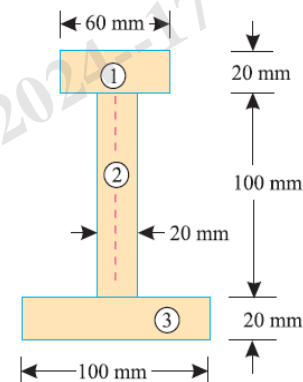


Fig. 4

(16)

Q6

A sphere of mass 1 kg, moving at 3 m/s, overtakes another sphere of mass 5 kg moving in the same line at 60 cm/s. Find the loss of kinetic energy during impact, and show that the direction of motion of the first sphere is reversed. Take coefficient of restitution as 0.75.

(16)

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree(B.Tech and M.Tech)
Sub Code: 23HS1002

2nd Semester Regular Examination: 2023-24

SUBJECT: English for Technical Writing

BRANCH: AEIE, AUTO, BIOTECH, CE, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, EC, E, EEE, ELECTRICAL, ETC, MECH, METTA, MINING, MME, PT

Time: 3 Hours

Max Marks: 100

Q.Code: P568

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- The process by which ideas are converted into messages is known as _____.
- What is haptics?
- Write the bias free substitute of manmade and weatherman.
- What is extra personal communication?
- The students have completed the assignment. Convert to passive
- Unless you do not work hard, you will not excel in the examination. Correct the sentence.
- Identify the number of syllables in technology and university.
- You are writing a letter to order some books from a publisher. Write the sample inside address to be written in it.
- In a personal interview, what is an icebreaker session?
- Differentiate between notice and circulars.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Barriers or filters might cause communication to break down at times. Describe the kinds of barriers that make communication difficult.
- Bias-free language is free of stereotypes and discriminatory terms related to gender, race, age, disability, class, or sexual orientation. Discuss with suitable examples.
- Discuss some of the advantages and disadvantages of written communication.
- We make assumptions about what might have happened, what might happen, and what we hope would happen using conditional sentences. Discuss English conditional sentences and their usage.
- What is grapevine? Discuss the importance of grapevine in organizations.

- f) Time is a notion that is connected to how we view the world. As opposed to this, tense is a grammatical category that indicates when an action or event occurred across time and is indicated by a change in verb form. Discuss with an appropriate examples.
- g) Discuss the classification of English vowel and consonant sounds.
- h) What is raising tone and where it is used?
- i) A change in stress from one syllable to another in an English word alters its meaning. Discuss with suitable examples.
- j) Discuss coherence and cohesion as an important feature of paragraph writing.
- k) What is the importance of an agenda and minute in a business meeting?
- l) Suppose you want to avail a study loan from state bank of India. Write a letter to the branch manager of your locality requesting him to send you all the information related to study loan.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- | | | |
|-----------|---|-------------|
| Q3 | You want to setup a LED manufacturing unit in your locality. Write a business proposal to the District Development Manager, NABARD for financial assistance. | (16) |
| Q4 | It's essential to learn how cultural factors affect group and individual communication in the workplace in today's constantly changing professional environment. Discuss some strategies to enhance intercultural communication at workplace. | (16) |
| Q5 | Interviews can sometimes make people nervous, so it's often helpful to prepare before each interview. Discuss how to prepare for a job interview. | (16) |
| Q6 | Write a job application along with your CV for the post of Junior Engineer as a response to the advertisement published in the Times of India dated 20 April 2024. | (16) |

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

23BS1004

2nd Semester Regular Examination: 2023-24

SUBJECT: Mathematics - II

BRANCH(S):

AE, AEIE, AERO, AME, AUTO, BIOMED, BIOTECH, C&EE, CE, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL&C.E, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PLASTIC,

PT, CE, CSE, ECE, EE, ME

Time: 3 Hour

Max Marks: 100

Q.Code: P220

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- The exact differential equation $Mdx + Ndy = 0$ will be exact if and only if _____.
- The integrating factor for $ydx - xdy = 0$ is _____.
- Consider a differential equation $dy/dx - y = x$ with the initial condition $y(0) = 0$. Using Euler's first order method with a step size of 0.1, find the value of $y(0.3)$.
- What is the differential equation of all parabolas whose directrices are parallel to the x-axis?
- Curl of $\vec{f}(x, y, z) = 2xy\hat{i} + (x^2 + z^2)\hat{j} + 2zy\hat{k}$ is _____.
- If C represents a line segment between (0,0,0) and (1, 1, 1) in the Cartesian coordinate system, the value of the line integral given below will be _____.
 $\int_C [(y+z)dx + (x+z)dy + (x+y)dz]$
- Find the value of $\int_0^\pi \sin^2 x \cos^4 x dx$
- Express $5^3 = 125$ in logarithm form.
- If $f(x) = [x]$ where $[.]$ denotes greatest integer function and $g(x) = 2x$ then find the value of $\text{gof}(-3/2) + \text{gof}(5/2)$?
- If $\frac{4+3i}{3-4i} = x + jy$, then what is the value of $\frac{x}{y}$

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Solve the following differential equation:

$$\frac{dy}{dx} + y \sec x = 7$$

- b) Solve the Bernoulli equation $y' + y = e^x x^3$

c) Find a power series solution for the following differential equations.

$$y'' + 6y' = 0$$

d) Solve the differential equation by using a variation of parameters, $y'' + 9y = \sec 3x$

e) What is Cauchy Riemann equation for the function $f(z) = \frac{\bar{z}^2}{z}, z \neq 0$ and $f(0) = 0$.
Show that Cauchy Riemann equation are satisfied at $(0, 0)$ but is not differentiable at $(0, 0)$

f) Evaluate the line integral $\int_{AB} (x + y)dx + x dy$

1) AB is the line segment from $A(0, 0)$ TO $B(1, 1)$

2) AB is the parabola $y = x^2$ from $A(0, 0)$ TO $B(1, 1)$

g) Solve for x if $\log(x - 1) + \log(x + 1) = \log_2 1$

h) Find the solution of $y'' - 6y' + 13y = 0, y(0) = 0, y'(0) = 10$.

i) State and prove the Residue Theorem.

j) The potential that represents an inverse square force is

$V(x, y, z) = K/(X^2 + Y^2 + Z^2)^{1/2}$ where K is a constant. Using the definition

$F = -\nabla V$ then calculate the components of this force.

k) Evaluate, $\int_c \frac{z^2}{z-5} dz$, where "c" is the circle such that $|z| = 2$?

l) Let $V = 4x^2yz^3$ at a given point P (1, 2, 1), then find the potential V at P and also verify whether the potential V satisfies the Laplace equation or not.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Show that an analytic function with constant modulus is constant. (8x2)

b) Check $f(z) = z^2$ is analytic or not. Justify your answer

Q4 a) Solve the Legendre's linear equation $[(3x + 2)^2 D^2 + 3(3x + 2)D - 36]y = 3x^2 + 4x + 1$ (8x2)

b) Solve the initial-value problem.

$$y'' + 5y' + 6y = 0, y(0) = 0, y'(0) = -2$$

Q5 a) Find the value of the line integral $\oint_c -2ydx + (3x - 4y^2)dy + (z^2 + 3y)dz$ (8x2)

b) Calculate the work done on a particle by force field $F(x, y) = y + \sin x$, as the particle traverses circle $x^2 + y^2 = 4$ exactly once in the counter clockwise direction, starting and ending at point (2, 0).

Q6 a) Solve Laplace equation, $\partial^2 u / \partial x^2 + \partial^2 u / \partial y^2 = 0$, with the boundary conditions: (8x2)

(I) $u(x, 0) = 0$

(II) $u(x, 1) = 0$

(III) $u(0, y) = F(y)$

(IV) $u(1, y) = 0$.

b) Proof of Cauchy's integral theorem

Registration No.:

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Total Number of Pages: 03

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: RPL2B001

2nd Semester Back Examination: 2023-24

SUBJECT: Programming For Problem Solving Using C

BRANCH(S):

AE, AEIE, AERO, AUTO, CHEM, CIVIL, CSE, CSEAI, CSEAIM, CSEDS, CSIT, CST, ECE, EEE, EIE, ELEC
TRICAL, ELECTRICAL & C.E, ETC, IT, MANUTECH, MECH, MINING, MME, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: P580

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Differentiate between compilation error and logical error with an example.
- Briefly write about conditional operator with a suitable example.
- Write a program segment to swap (interchange) two variables without using a third variable.
- With proper justification, explain the output of the following code segment.

```
#include <stdio.h>
int main() {
    char ch = 'X' ;
    printf("%lu,%lu\n", sizeof(ch), sizeof('X')) ;
    return 0;
}
```
- Predict the output of below program:

```
#include <stdio.h>
int main()
{
    int arr[5];
    // Assume base address of arr is 2000 and size of integer is 32 bit
    printf("%u %u", arr + 1, &arr + 1);
    return 0;
}
```
- Write the C code to allocate space dynamically to a two-dimensional array of size 20 X 30.
- Explain the meaning of the following declaration.

```
int *fun (char*, int*) ;
```
- Write the routine for insertion operation from the end of a singly linked list.
- Give an example of a double linked list with 3 nodes. Mention tentative address of each node and fill the pointers accordingly.
- Write any three library functions to read from a file. If fopen() functions is not able to open a file, what does it returns?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 × 8)

- a) An electricity board charges the following rates for the use of electricity: for the first 150 units Rs. 1 per unit; for the next 100 units Rs. 2 per unit; beyond 250 units Rs. 3 per unit. All users are charged a minimum of Rs. 75 as meter charge. If the total amount is more than Rs. 300, then an additional surcharge of 12.5% of the total amount is charged. Write a program to read the number of units consumed and print out the charges. Use single-line comments to denote the charge ranges.
- b) What is recursion in C functions? Define a recursive function that takes input as number of terms 'n' and returns the n-th Fibonacci term.
- c) Write a program to print the Pascal's triangle up to 'n' rows in pyramidal form as shown:

```
      1
     1 1
    1 2 1
   1 3 3 1
  1 4 6 4 1
```

Here 'n' is 5. Take 'n' as user input and use only main() function.

- d) Write the program to find out value $\sin(x)$ using the following power series expansion up to accuracy 0.00001.
 $\sin(x) = x - x^3/3! + x^5/5! - + \square\square\square$
Take the value of x as user input. $0 < x < 1$ (x is in radian).
- e) Distinguish between Call by value and Call by reference with suitable example.
- f) Write a C program to find the number of matching substrings in a string and print their position in the string.
Input: string= abbacccacbac, substring=bac
Output: number of matching=2, positions=3, 10
- g) What is a structure? Define a structure called cricket that will describe the following information:
- player name
 - team name
 - batting average
- Using cricket, declare an array player with 50 elements and write a program to read the information about all the 50 players and print a team-wise list containing names of players with their batting average.
- h) Define string. List out all string manipulation functions. Explain any two with examples.
- i) Write a C program to create a file to store sequentially a list of products with the data – ID, Name, Rate, and Quantity.
Read the same file after creation and generate total bill amount.
- j) Write and explain insertion sort algorithm and find its time complexity.
- k) Write a C program to implement merge sort.
- l) Write a C program to implement the binary search. What is the time complexity of linear search and binary search?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Write the syntax of different branching statements and explain their working with examples. (16)
Distinguish between entry-controlled loop and exit controlled loop with suitable examples. Write a program to find the sum of all prime numbers from 1 to n (taking n as user input).
- Q4** What is an array? Discuss different ways to declare and define one-dimensional and two-dimensional arrays with suitable examples. (16)
Write a C program to enter a matrix of order m X n then print the difference between sum of the elements of main diagonal and sum of the elements of first row of the matrix.
- Q5** Define function in C programming? Classify the user defined functions in C based on parameter passing and return type with suitable examples. (16)
Like Fibonacci, there exists a Tribonacci series where the n-th term is defined as:
 $T(n) = T(n-1) + T(n-2) + T(n-3)$, where $T(0) = 0$, $T(1) = T(2) = 1$
Define a recursive function that takes 'n' as user input and prints the n-th Tribonacci term.
- Q6** Differentiate between structure and union, with an appropriate example that demonstrates the storage of the data members. (16)
You are required to rank the students of a classroom based on their marks in a particular subject. Define a student structure containing the members – ID, Name, Marks, and Rank. Provide user input facility for 10 students' data (ID, Name, Marks).
Give the rank values as per the student ranking in the class. Define functions to print the data as a table.

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23ES1005

2nd Semester Regular Examination: 2023-24

SUBJECT: Basic Civil Engineering

BRANCH(S): ALL

Time: 3 Hour

Max Marks: 100

Q.Code : P521

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- a) Differentiate between sub-structure and superstructure.
- b) State the two functions of foundation of a structure.
- c) Mention two uses of cement mortar.
- d) Write two advantages of painting a building.
- e) Differentiate between rigid and flexible pavement.
- f) State two major sources of water supply system.
- g) Define disinfection process in water treatment.
- h) Mention the two purpose of construction of dams.
- i) Write two importance of irrigations.
- j) State tow basic requirement of urban roads.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- a) Explain the importance of civil engineering in the infrastructure development of country.
- b) Provide a detail classification of bricks as per Indian standards.
- c) State about the different types of glass used in construction and their uses.
- d) Write the different applications of concrete in construction sector.
- e) Provide the basic layout of public water supply system.
- f) Explain about the basic components of road with neat sketch.
- g) Write a short note on various types foundations used in construction.
- h) Give a layout of canal irrigation system with neat sketch.
- i) Name the different types of cements used in construction work.
- j) Provide a brief classification of various types plastics used in construction work.
- k) Write in brief about the importance of irrigation in India.
- l) State the purposes of construction of dams in India.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Provide a detailed classification of buildings as per national building code (NBC). **(16)**
- Q4** Discuss in detail about the classification of stones with examples. **(16)**
- Q5** Classify the rural and urban roads as per Indian standards. State the advantages of the three major modes of transportations. **(16)**
- Q6** Describe in brief about the different steps involved in conventional water treatment process with diagram. **(16)**

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: RBE2B001

2nd Semester Back Examination: 2023-24

SUBJECT: Basic Electrical Engineering

BRANCH(S): AE, AEIE, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MECH, MINING, MME

Time: 3 Hour

Max Marks: 100

Q.Code : P372

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

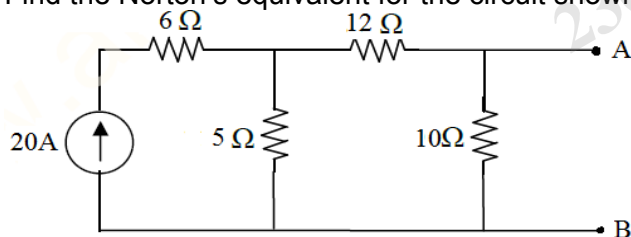
Q1 Answer the following questions: (2 x 10)

- State the steps to solve the circuit using super position theorem.
- Mention the functions of no-load current in a transformer.
- Mention the limitations of Norton's theorem.
- State Faraday's Laws of Electromagnetic Induction.
- Draw circuit, waveforms and Phasor Diagram for pure Series R-L Circuit. Write equation of Power.
- Define form factor and crest factor. What is the significance of form factor?
- An 1100/400 V, 50 Hz single phase transformer has 100 turns on the secondary winding. Calculate the number of turns on its primary.
- Give the relation between flux, magnetomotive force, and reluctance.
- If voltage across an impedance of $Z = 5 + j7$ is $110 \angle 30^\circ$. Find the current in polar form.
- What do you mean by power factor and apparent power?

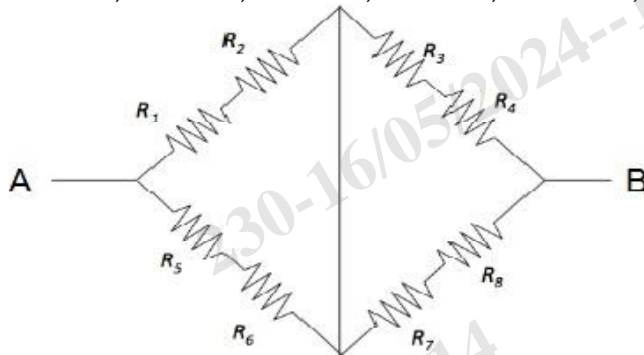
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- A three single phase balanced load connected in three phase three wires star form, with the help of phasor diagram, obtain the relationship between line and phase quantities of voltage and current.
- Find the Norton's equivalent for the circuit shown below.



- c) Find the equivalent resistance between AB for the circuit shown below.
 $R_1 = 4\Omega$, $R_2 = 2\Omega$, $R_3 = 8\Omega$, $R_4 = 1\Omega$, $R_5 = 12\Omega$, $R_6 = 3\Omega$, $R_7 = 10\Omega$, & $R_8 = 5\Omega$



- d) Draw the no-load phasor diagram and give brief explanation.
e) Define Instantaneous Value, Amplitude, RMS value and Average Value of an A.C. Quantity.
f) Derive the emf equation for DC generator from the first principle.
g) Two circuits, the impedances of which are given by $Z_1 = 10 + j15 \Omega$ and $Z_2 = 6 - j8 \Omega$, are connected in parallel. If the total current supplied is 15 A, what is the power taken by each branch.
h) With the help of neat diagram, explain the constructional details of three phase induction motor.
i) A pure inductor excited by sinusoidally varying AC voltage. Show that the average power consumed by inductor is zero.
j) Derive the voltage and current relations in three phase balanced circuits for delta connection.
k) What are the different types of D.C. motors. Explain in detail.
l) Mention the Procedure for conducting O.C. test on a single-phase transformer. Explain with neat diagram.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** An iron ring of a mean diameter 15cm and 10m^2 cross section is wound with 200 turns of wire. There is an air gap of 2mm cut in the ring for a flux density of 1 Web/m^2 , and relative permeability of 500. Find the exciting current, the inductance and the stored energy. (16)
- Q4** A 5KVA, 500/250V, 50Hz, single - phase transformer gave the following results: (16)
From O.C. Test: 500V, 1A, 50W (H.V. Side is opened)
From S.C. Test: 25V, 10A, 60W (L.V Side is shorted)
Determine: (i) The Efficiency on Full-load, 0.8 lagging P.F. (ii) The Voltage Regulation on Full-load, 0.8 lagging P.F. (iii) The Efficiency on 60% of Full-load, 0.8 lagging P.F. (iv) The Voltage Regulation on Full-load, 0.6 leading P.F.
- Q5** With detail schematics list the various types of D.C. Generators and Explain in detail. (16)
- Q6** Draw the equivalent circuit diagram of the 3-phase induction motor with proper explanation. (16)

Registration No.:

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Total Number of Pages:02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23ES1002

2nd Semester Regular Examination: 2023-24

SUBJECT: BASIC ELECTRONICS

BRANCH(S): AEIE,AUTO,BIOTECH,CE,CHEM,CIVIL,CSE,CSEAI,CSEAIME, CSEDS,CST, ECE,EEE,ELECTRICAL, ETC,MANUTECH,MECH,METTA,MINERAL,MME,PLASTIC

Time: 3 Hour

Max Marks: 100

Q.Code: P373

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is drift current in a semiconductor?
- Determine the DC resistance of a diode at $V_D = -10V$ if its reverse saturation current is $1\mu A$ ($V_T = 25mV$ at room temperature)
- What is DC load line? How is Q point plotted on the DC load line?
- Why FET is called as a voltage-controlled device?
- What is the β value of a BJT for $\alpha = 0.99$?
- What is negative feedback? What is its use in amplifier?
- Define CMRR. An OPAMP has common mode gain of 0.01 and differential mode gain of 10^5 . Find its CMRR in decibel.
- Convert the numbers: $(475.25)_8 = (\quad)_{10}$ and $(AE.2B)_{16} = (\quad)_8$
- Prove the Boolean Identity, $(A+B)(A+C) = A + BC$.
- What is Frequency modulation and write its application in real scenario?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Determine V_0 , I_1 , I_{D1} , and I_{D2} for the parallel diode configuration as in Fig. 1.

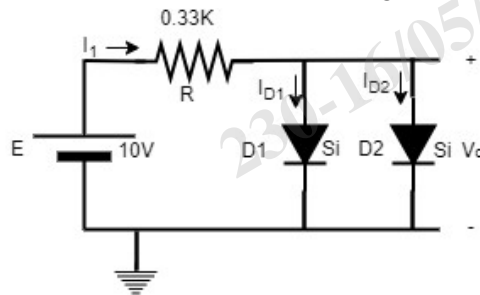


Fig. 1

- Explain the operation of bridge type full wave rectifier circuit with waveforms.

- c) In a fixed bias Silicon n-p-n transistor (CE) circuit with $\beta = 120$, $V_{CC} = +16V$, $R_C = 1.8K\Omega$, $R_B = 510K\Omega$ are used. Find $I_{B,Q}$, $I_{C,Q}$, $V_{CE,Q}$, V_C , V_B , and V_E .
- d) Define pinch off voltage with respect to different characteristics of an n-channel JFET? When V_{GS} of JFET changes from $-3.1V$ to $-3V$, the drain current changes from $1mA$ to $1.3mA$. What is the value of transconductance?
- e) Explain the steps to be followed for the fabrication of monolithic IC.
- f) Write the difference between D-MOSFET and E-MOSFET with characteristics curve.
- g) Write the difference between Zener breakdown and avalanche Breakdown.
- h) Perform $(26)_{10} + (13)_{10}$ in binary. Find the 1's and 2's complement of the binary number $(1011)_2$.
- i) In a negative feedback system, gain without feedback is $60dB$. It decreases to $40dB$ with feedback. Calculate the feedback factor.
- j) List the four basic feedback topologies. Draw the voltage series feedback circuit and current series feedback circuit.
- k) Explain the working principle of DSO with neat diagram.
- l) Define modulation. Explain the AM modulation with block diagram.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Explain the physical structure, operation, and characteristics of n-channel Enhancement MOSFET. (16)
- Q4** a) Explain the operation of Op-amp as non-inverting amplifier. Find the close loop gain of the non-inverting amplifier circuit. (8)
- b) Find the output voltage of the following Summing Amplifier circuit as in Fig. 2. (8)

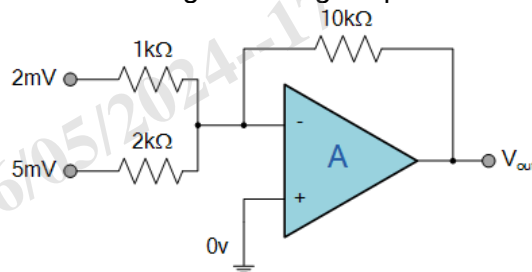


Fig. 2

- Q5** Given Boolean expression $X = \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C$ (16)
- (a) Obtain the truth table of function X
 - (b) Draw the logic diagram, using original Boolean expression
 - (c) Use Boolean algebra to simplify the function to a minimum number of literals.
 - (d) Draw the logic diagram, from the simplified expressions.
- Q6** Define modulation. Explain the difference between amplitude modulation and frequency modulation with equation and waveform. (16)

Registration No.:

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Total Number of Pages: 02

Course: Integrated Dual Degree
(B.Tech and M.Tech)
Sub_Code: 23ES1006

2nd Semester Regular Examination: 2023-24

SUBJECT: Basic Mechanical Engineering

BRANCH(S): AEIE, AUTO, BIOTECH, CE, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ETC, MECH, METTA, MINING, MME

Time: 3 Hours

Max Marks: 100

Q.Code: P523

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Differentiate between point function and path function with examples.
- Describe PMM1 and PMM2. Mention their thermodynamic significance.
- Define solidification shrinkage in casting. Mention the function of riser.
- Liquid droplets are spherical in shape. Why?
- What is compressibility? How does compressibility affect the behavior of fluids?
- Explain conduction and convection modes of heat transfer with suitable examples.
- Distinguish between saturated vapor and superheated vapor.
- Differentiate between shaft and axle in a motion and power transmission system.
- Write down four different elements of power transmission system.
- Highlight the advantages of belt drive over chain drive.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- State first law of thermodynamics. Mention its limitations. How are these limitations addressed in thermodynamic system?
- Define entropy. Highlight its characteristics. Is it a property of the system? Justify your answer.
- Distinguish between Newtonian and Non-Newtonian fluids. Explain the characteristics of shear stress vs shear strain for different fluids.
- Name the properties of fluids which contribute to the following effects:
(I) walking of an insect on water surface, (II) surface erosion of turbomachinery parts, (III) water absorption in plant's roots, (IV) speed of sound in air, (V) boiling of water, and (VI) resistance to fluid flow.

- e) Explain heat transfer process because of convection. Highlight the factors which affect the rate of heat transfer because of convection. What are the possible ways to enhance heat transfer due to convection?
- f) Explain the working principle of four-stroke petrol engine with neat sketches.
- g) Show that COP of heat pump will always be greater than unity.
- h) Explain with neat sketch the working principle of reciprocating air compressor.
- i) Describe the functionalities of different parts in a sand mould casting process.
- j) Explain in details different properties of engineering materials.
- k) Define thermodynamic work. Explain any three types of thermodynamic work.
- l) Name the type of gear drives used for following power transmission purposes: (I) between two parallel shafts at low speed, (II) between two parallel shafts at high speed, (III) with large speed reduction, (IV) converting rotary motion to translatory motion, (V) between two inclined and intersecting shafts, and (VI) between two non-parallel and non-intersecting shafts.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) 5 m³ of air at 2 bars and 27 °C is compressed to 6 bar in a polytropic process: $pV^{1.3} = \text{Constant}$. It is subsequently expanded to 2 bar in a reversible adiabatic process. Find the net work done in kJ. **(8+8)**
- b) A gas enters into a gas turbine at 40 bar, 1047 °C having velocity 200 m/s. It leaves the turbine at 1 bar with a velocity of 100 m/s. Turbine is insulated such that process can be assumed adiabatic. Find the work output of the turbine per unit mass flow rate. (Consider $C_p = 1.05 \text{ kJ/kg-K}$ and $\gamma = 1.4$)
- Q4** a) A heat pump working on a reversed Carnot cycle takes energy from a reservoir maintained at 5 °C and deliver it to another reservoir, where temperature is 77 °C. The heat pump takes power for its operation from a heat engine operating within higher and lower temperatures of 1077 °C and 77 °C. Estimate the energy taken from the reservoir at 1077 °C. **(8+8)**
- b) A well-insulated rigid container contains 1 m³ of air having a mass of 1 kg. The pressure inside the container is 10⁵ Pa. A stirrer connected to a motor of power 10.5 kW is rotated inside the container. Calculate the temperature inside the container after 2 secs. (Consider $C_v = 0.717 \text{ kJ/kg-K}$ and $R = 0.287 \text{ kJ/kg-K}$).
- Q5** a) Explain with neat sketch the working principle of steam power plant. **(8+8)**
- b) Describe p-T diagram for water highlighting all the phase change processes. Identify triple point in it. Explain why triple point is called as point of invariant.
- Q6** a) Explain welding process. Describe forehand and backhand welding with neat sketches. Highlight the functionalities of welding electrode, flux and filler rod in a welding process. **(8+8)**
- b) Describe the anatomy of a typical industrial robotic arm and its components. How do these components work together to achieve precise and flexible movements?

Registration No:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

REM2B001

2nd Semester Back Examination: 2023-24

SUBJECT: Engineering Mechanics

BRANCH(S):

AE, AEIE, AERO, AG, AUTO, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MANUTECH, MECH, MINING, MME, PLASTIC

Time: 3 Hour

Max Marks: 100

Q.Code : P468

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What are the methods for finding out the resultant force for a given system of forces?
- How will you represent the moment of a force geometrically?
- What are different methods of studying the equilibrium of coplanar forces?
- Distinguish between centre of gravity and centroid.
- State the theorem of perpendicular axis.
- State the relationship between number of members (m) and number of joints (j) in a perfect truss.
- Distinguish between Inertial and Non-inertial frame of reference.
- State the law of conservation of momentum.
- State D' Alembert's Principle for a rigid body in plane motion.
- Define the coefficient of restitution.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain the term 'Force' and list its characteristics.
- What are the different types of parallel forces? Distinguish between like and unlike parallel forces.
- State and prove Lami's Theorem.
- Two men carry a weight of 2 kN by means of two ropes fixed to the weight. One rope is inclined at 45° and the other at 30° with their vertices. Find the tension in each rope.
- Explain the followings:
 - Laws of static friction
 - Limiting angle of friction.
- State and prove Parallel axis theorem.
- Write short note on principle of virtual work.
- A ball is thrown vertically upwards with an initial velocity of 36 m/sec. After 2 seconds, another ball is thrown vertically upwards. What should be its initial velocity so that it crosses the first ball at a height of 30 m?
- A bomber is flying horizontally at an altitude of 2400 m with the uniform velocity of 1000 kmph to bomb a target. Where the bomb should be released to strike the target?

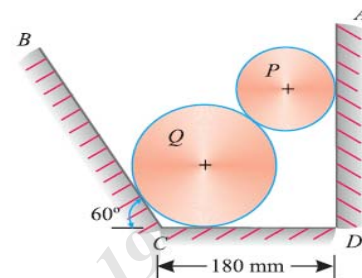
- j) A man weighing 'W' Newton entered a lift which moves with an acceleration of 'a' m/sec². Find the force exerted by the man on the floor of lift when
 (i) lift is moving downward
 (ii) lift is moving upward
- k) A particle, starting from rest, moves in a straight line, whose equation of motion is given by: $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds.
- l) A wheel is rotating about its axis with a constant acceleration of 1 rad/sec². If the initial and final velocities are 50 rpm and 100 rpm, determine the time taken and number of revolution made during this period.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3

Two cylinders P and Q rest in a channel as shown in Fig. 1. The cylinder P has diameter of 100 mm and weighs 200 N, whereas the cylinder Q has diameter of 180 mm and weighs 500 N. If the bottom width of the box is 180 mm, with one side vertical and the other inclined at 60°, determine the pressures at all the four points of contact.



(16)

Fig. 1

Q4

Determine the forces in all the members of the truss shown in Fig. 2.

of (16)

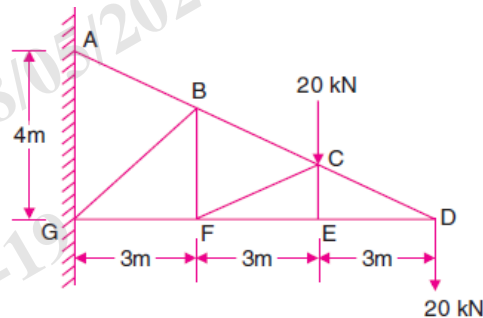


Fig. 2

Q5

Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in Fig. 3. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Using D'Alembert's principle determine the acceleration of the weight and tension in the thread.

(16)



Fig. 3

Q6

The system shown in Fig. 4 has a rightward velocity of 4 m/sec, just before a force P is applied. Determine the value of P that will give a leftward velocity of 6 m/sec in a time interval of 20 sec. Take coefficient of friction = 0.2 and assume ideal pulley.

(16)

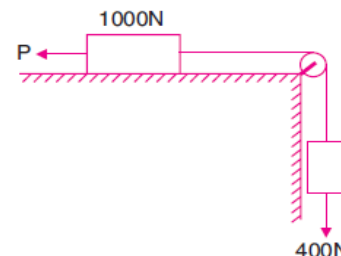


Fig. 4

Registration No.:

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Total Number of Pages: 02

Course: Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: RMA2A001

2nd Semester Back Examination: 2023-24

SUBJECT: Mathematics-II

BRANCH(S):

AE, AEIE, AERO, AUTO, CHEM, CIVIL, CSE, CSEAI, CSEAIM, CSEDS, CSIT, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & CE, CSE, ME

Time: 3 Hour

Max Marks: 100

Q.Code: P221

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- If A is a square matrix such that $A^2 = A$, then $(I - A)^3 + A$ is equal to
- The rank of the matrix $M = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ is _____.
- The modulus of eigenvalues of an orthogonal matrix is _____.
- If A is a square matrix of order 3 such that $|A| = 3$, then $\text{adj}(\text{adj } A)$ is _____.
- What would be the length of the curve, if the radius of the curve is 24.69 m and the angle is given as $12^\circ 42'$?
- Find the additive inverse of a matrix $A = \begin{bmatrix} 2 & 1 \\ -3 & 0 \end{bmatrix}$
- What is the flux through a cube of side 'a' if a point charge of q is at one of its corner?
- The resistivity of a material of resistance is 200 ohm, length 10 m and area twice that of the length is _____.
- How many odd and even phases are required respectively to sort the given array using odd-even sort. $\text{arr} = \{3, 2, 3, 8, 5, 6, 2, 1\}$.
- Find b_n when we have to find the half range sine series of the function x^2 in the interval 0 to 3.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Find all solutions of the following system of linear equations.
$$4x_2 + 8x_3 = 12$$
$$x_1 - x_2 + 3x_3 = -1$$
$$3x_1 - 2x_2 + 5x_3 = 6$$
- Find Inverse of the following matrix using Gauss-Jordan Elimination method

$$A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

- Find eigenvalues of the following 2 x 2 matrix

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$$

- Prove that each complex $n \times n$ matrix A can be written as $A = B + iC$,

- e) Determine the length of $y = \ln(\sec x)$ between $0 \leq x \leq \pi/4$
- f) Compute $\text{div} \vec{F}$ and $\text{curl} \vec{F}$ for $\vec{F} = x^2 y \hat{i} - (z^3 - 3x) \hat{j} + 4y^2 z \hat{k}$
- g) Find the line integral of $\oint_C (1 + x^2 y) ds$
Where C is considered as an ellipse
 $\vec{r}(t) = (2\cos t) \hat{i} + (3\sin t) \hat{j}$
for $0 \leq t \leq 2\pi$
- h) Verify Green's theorem in a plane for $\int_C [(3x^2 - 8y^2) dx + (4y - 6xy) dy]$
Where, C is the boundary of the region defined by the lines $x = 0$, $y = 0$ and $x + y = 1$.
- i) Evaluate $\iint_S (z + 3y - x^2) dS$ where S is the portion of $z = 2 - 3y + x^2$ that lies over the triangle in the xy -plane with vertices $(0, 0)$, $(2, 0)$ and $(2, -4)$
- j) Find the Fourier series of the function $f(x) = x^2$, $-\pi < x < \pi$.
- k) Identify whether the following functions are even, odd, or neither
 $f(x) = x^2 - 1$
 $g(x) = |x - 1|$
 $h(x) = -3x^5$
- l) Let W be the set of 3×3 skew-symmetric matrices. Show that W is a subspace of the vector space V of all 3×3 matrices. Then, exhibit a spanning set for W.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Solve the given set of equations by using Gauss elimination method: (16)
- $$\begin{aligned} x + y + z &= 4 \\ x + 4y + 3z &= 8 \\ x + 6y + 2z &= 6 \end{aligned}$$
- Q4** a) Find eigenvalues and eigenvectors corresponding to counterclockwise rotation through the angle $\pi/2$ about the origin in \mathbb{R}^2 . (8x2)
- b) Diagonalize the given matrix:

$$A = \begin{bmatrix} 4 & -3 & 0 \\ 2 & -1 & 0 \\ 1 & -1 & 1 \end{bmatrix}$$
- Q5** a) Find the gradient $\nabla f(x, y)$ of each of the following functions: (8x2)
- i) $f(x, y) = x^2 - xy + 3y^2$ ii) $f(x, y) = \sin 3x \cdot \cos 3y$
- b) Vector field $\vec{a} = x^3 \hat{j} - y^3 \hat{i}$ and C is the circle of radius R centred on the origin.
Derive $\oint_C \vec{a} \cdot d\vec{l}$
- Q6** a) Find the Fourier transform of e^{-ax^2} , where $a > 0$. (8x2)
- b) Find the Sine Transform of e^{-ax} , where $a > 0$

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)
Sub_Code: RPH2A001

2nd Semester Back Examination: 2023-24

SUBJECT: Physics

BRANCH(S):

AE, AEIE, AERO, AUTO, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ENV, ETC, IT, MECH, MINING, MME, PLASTIC, ME

Time: 3 Hour

Max Marks: 100

Q.Code: P297

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What are free and forced oscillations?
- If a particle executes a simple harmonic motion of period 8 s and amplitude 0.40 m, find the maximum velocity and acceleration.
- Define Interference of waves. Write the types of Interference.
- When monochromatic light is incident on a slit of width 0.022 mm, the first diffraction minimum is observed at an angle of 1.8° from direction of incident light. Find out λ .
- A silica glass optical fibre has a core refractive index of 1.500 and the cladding refractive index of 1.450. Calculate critical angle for core-cladding interface and numerical aperture (NA) of the fibre.
- What is the difference between Crystalline and Amorphous Solid?
- State Gauss law in electrostatic field. Write its integral and differential form.
- What is the physical significance of curl of a vector field?
- What is pair production?
- What is Compton effect? Write expression for Compton shift.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Starting from the differential equation of a damped oscillator, write the solution for under damped oscillatory motion. Graphically show the variation of amplitude with time. Mention the condition for critical damping.
- Two simple pendulum of mass m and length l each are coupled by a spring of force constant k . Write the expression for frequency of normal modes of vibration of the coupled system.

- c) What is a zone plate? Mention the similarities and difference between a converging lens and a zone plate.
- d) What is a Bi-prism? How can the wavelength of monochromatic light be measured with the help of a Fresnel's Bi-prism.
- e) Show that the radii of Fresnel half period zones are proportional to the square root of nature numbers.
- f) Write about the basic characteristics of optical fiber and its application in communication system.
- g) What do you mean by energy band gap? Classify metals, semiconductor, and insulators in terms of band theory.
- h) Prove that the curl of gradient of a scalar field is zero and divergence of curl of a vector field is zero.
- i) Derive a relation between magnitudes of electric vector and magnetic vector.
- j) What do you mean by Photoelectric effect? Discuss Einstein's photoelectric equation. Define Stopping potential.
- k) What is uncertainty principle? Using uncertainty principle, show the non-existence of electron inside the nucleus.
- l) If the wavefunction of a moving particle $\psi = A \sin(\pi x/L)$ is normalized in $0 < x < L$, find the value of normalization constant then write the normalized wavefunction.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Set up the differential equation for a forced oscillator. Solve it to obtain the displacement $x(t)$ of vibrating particle. (6)
- b) Give the theory of Newton's ring. Explain how the wavelength of monochromatic light and refractive index of liquid is determined using Newton's ring arrangement. (10)
- Q4** a) With a suitable diagram explain the construction and working of He-Ne laser. What are the advantages and limitations of a He-Ne Laser? (12)
- b) Explain Bragg's law of X-ray diffraction. State its significance. (4)
- Q5** a) State Maxwell's equations in differential and integral forms both in presence and absence of free charge and currents. Discuss the significance of each Maxwell equation. (10)
- b) Show that electromagnetic waves are transverse in nature. (6)
- Q6** a) Starting from the Schrodinger's equation for a particle confined in a one dimensional box of infinite height, develop an expression for the normalized wave function. Show that its energy is discrete and quantized. (12)
- b) What are matter waves? If the ratio of the velocities of proton and α -particle is 8:1; then find the ratio of their de-Broglie wavelengths. (4)

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23BS1002

2nd Semester Regular Examination: 2023-24

SUBJECT: PHYSICS

BRANCH(S): ALL

Time: 3 Hour

Max Marks: 100

Q.Code:P296

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is the criterion for the motion to be simple harmonic?
- In an RLC Circuit, inductance is 5 mH, the capacitance is 6 μ F, and resistance is 200 Ω , then, is the circuit underdamped, critically-damped, or over-damped?
- What is the basis of Huygens' principle?
- A wave is represented by $y(x,t) = [8\text{cm}] \sin [(10 \text{ rad/cm}) x - (10 \text{ rad/s}) t]$
Determine the amplitude, wavelength, angular frequency, and velocity of the wave.
- If $V = 3x^2y - y^3x^2$, Calculate grad V at point (1, -2, -1)?
- State Gauss divergence theorem and write the mathematical form.
- State de-Broglie hypothesis for matter wave.
- The probability that a system can be in the states represented by Eigen functions ψ_1 , ψ_2 , ψ_3 , are 1/2, 1/3, 1/4 respectively. Write the wave function for the system. If the energy eigen values for the given states are 2 eV, 3 eV and 4 eV respectively. Find the energy expectation value.
- What is population inversion in LASER?
- Write down the differences between spontaneous emission and stimulated emission of radiation.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Setup the differential equation for a one-dimensional simple harmonic oscillator. Show that the total energy of the oscillator is constant in time. Draw the variation of kinetic energy and potential energy with displacement.
- With suitable ray diagram explain the formation of Newton's rings. Why the fringes in Newton's rings interference pattern are circular?
- Set up the differential equation for a one-dimensional oscillator, subjected to a damping force proportional to velocity and an external periodic force. Discuss about frequency, phase, and amplitude of the forced oscillation.
- In Fraunhofer diffraction due to single slit, obtain the conditions for principal maximum, secondary maxima and minima. Show the distribution of intensity graphically in this diffraction pattern.

- e) Derive a relation between magnitudes of electric vector and magnetic vector.
- f) Calculate displacement current in terms of displacement current density using Maxwell idea and differentiate between conduction current and displacement current.
- g) Define divergence of a vector field. Write its physical significances. A vector field is given by

$$\vec{A} = \hat{i} 2xy + \hat{j} x^2y + \hat{k} xyz$$

Find the divergence and curl of the vector at the point (1, 1, -1).

- h) Define phase velocity and group velocity. Find a relation between group velocity and phase velocity?
- i) What is a wave function ψ ? What are the characteristics of ψ ? Explain if the wavefunction $\psi(x) = e^x$ is quantum mechanical wavefunction or not.
- j) Derive an expression for Schrodinger's time-independent wave equation. Explain the significance of a wave function.
- k) Draw the energy level diagram of the Helium-Neon laser. Explain the operation principle of the He-Ne laser
- l) Specify three possible types of transitions between two atomic energy levels and derive relations between Einstein's coefficients.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) What do you mean by damped oscillations? A mechanical damped oscillator is subjected to a damping force proportional to its velocity. Set up the differential equation of the oscillation. Discuss the underdamped, overdamped, and critical damped motions of the oscillator. (12)
- b) In Newton's Rings experiment, the diameter of the 15th ring was found to be 0.59 cm, and that of the 5th ring was 0.33 cm. If the radius of the plano-convex lens is 100 cm, calculate the wavelength of light used. What happens to ring diameter if air film is replaced with liquid of refractive index 1.5? (4)
- Q4** a) Write Maxwell's electromagnetic equations in integral and differential form. From Maxwell's electromagnetic equations in a conducting medium; obtain the electromagnetic wave equations for electric and magnetic field. (10)
- b) Prove the transverse nature of Electromagnetic Wave. (6)
- Q5** a) Starting from the Schrödinger equation for a particle confined in a one dimensional box of infinite height, develop an expression for the normalized wave function. (8)
- b) Calculate the expectation value of position x and linear momentum p_x for the wave function (8)

$$\psi(x) = \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L} \quad 0 < x < L$$

- Q6** (a) With a suitable diagram explain the construction and working of ruby laser. Draw the energy level diagram showing the operation of the ruby laser. Write limitations of ruby laser. (12)
- (b) The energy difference ΔE between two energy levels in a particular atom is 4 eV. If the electron moves from the higher level to the lower level, find the wavelength and frequency of the photon emitted in the emission process. (4)

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23ES1003

2nd Semester Regular Examination: 2023-24

SUBJECT: Programming in C and Data Structure

BRANCH(S):

AE,AERO,AME,BIOTECH,C&EE,CIVIL,CSE,CSEAI,CSEAIME,CSEDS,CSIT,CST,ECE,EEE,EL
ECTRICAL,ELECTRICAL & C.E,ETC,IT,MECH,METTA,MINERAL,MINING,MME

Time: 3 Hour

Max Marks: 100

Q.Code: P477

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) Define Data Structure. Differentiate between Linear and Non-Linear Data Structures.
- b) Find the Output of the code:

```
main()
{
    Int a[4] = {5,3,6,2};
    Int i =3, j=0;
    While(i)
    {
        j+=a[i] ;
        i--;
    }
    Printf("%d", j);
}
```

- c) Define a Sparse Matrix. Specify an Efficient Representation of Sparse Matrix.
- d) Compute the maximum number of comparisons required to search an element in an ordered list of 2048 elements using Binary Search. Compare it with Linear Search.
- e) Write the code to find the transpose of a matrix (2-Dimensional array)
- f) Differentiate between a pointer to array and array of pointers.
- g) Define a Queue. Specify the Conditions for a Circular Queue which is Full.
- h) What is a Complete Binary Tree? Draw a complete binary tree of height 3.
- i) What is the minimum and maximum number of passes required to sort an array of n numbers using bubble sort? Write the situation when it is minimum and when it is maximum.
- j) Differentiate between call by value and call by reference.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 × 8)

- a) Explain with example various types of if-else statements in C.
- b) Given a linked list with elements 10, 20, 30, 40, 50. Write the steps to perform the following operations from the single linked list.
 - i) Deletion from the beginning
 - ii) Deletion from the end
- c) Differentiate between structure and union with suitable example. Explain pointer to structure with example.
- d) Construct a binary search tree from the list of given elements:
21, 30, 39, 4, 14, 28, 18, 15, 10, 48, 52
- e) Differentiate between system defined and user defined functions with example.
- f) Find the postfix and prefix of the following expression.
(a+b)*(c+d)/e/f\$g
- g) Differentiate linear and binary search. Let A is the array of the following elements.
A = {2, 4, 6, 8, 9, 10, 12, 13}. Search the element **12** using binary search technique. Write its time complexity.
- h) Discuss the advantage and average efficiency of quick sort. Apply Quick sort on the following data and show the contents of the array every pass:
48, 7, 26, 4, 13, 23, 98, 57, 10, 5, 32
 - i) Write a program in C to find the roots of a quadratic equation.
 - j) Write a program in C to print first 50 Fibonacci numbers.
 - k) Write a Program to reverse a String using Stack.
 - l) Write a Program to Insert an Element **Num** at a specified position **pos** in the Array **A** with **N** Elements.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) What do you mean by Array? Write a Program to merge two sorted arrays to a single sorted array. (8)
 - b) Write an Algorithm to convert an infix expression to postfix expression using a Stack. (8)
Convert the given Infix expression to Postfix using the specified algorithm:
K + L - M*N + (O\$P) * W/U/V * T + Q
- Q4** a) What are the looping statements in C. Explain with suitable examples? (8)
 - b) Write a program in C to count the number of alphabets, digits, blank spaces, and special characters in a text. (8)
- Q5** a) Write a function to calculate the factorial of a number and use this function to find combination of two numbers. $c(n, r) = n! / (r!(n-r)!)$ (8)
 - b) Differentiate between static and dynamic memory allocation. Explain the use of malloc(), calloc(), and realloc() functions with example. (8)
- Q6** a) Write a program in C to multiply two matrices A(mxn) and B(nxp) to generate a matrix of size C(mxp). (8)
 - b) What is circular queue? Write the insertion and deletion procedure in a circular queue. (8)

Registration No.:

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Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23HS1001

2nd Semester Regular Examination: 2023-24

SUBJECT: Universal Human Values

BRANCH(S): All

Time: 3 Hours

Max Marks: 100

Q.Code: P585

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- How can you define "value"? Differentiate between 'value' and 'price' with one suitable example.
- What do you mean by 'self-exploration'? Please state the steps to develop the right understanding through self-exploration.
- Define Skill. Elaborate on it with a few examples. Highlight the differences between Values and Skills.
- State the five guidelines for 'Value Education'.
- Define 'happiness' and 'prosperity' as proposed in the UHV Content. Explain with two examples from your day-to-day life to support your answer.
- What is imagination? Is it taking place continuously or is it a temporary activity that you can start and stop at your will? Justify your answer with some examples.
- Define self-regulation and health. How are the two related?
- Define justice in relationship. What is its outcome?
- What is the building block for harmony in the society?
- List the four orders in nature with examples of units in each order. What is the basis of this classification?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What is the content of Value Education? Discuss the need of it in technical and other professional institutions. List any three implications of Value Education. Explain how they are related to your life.
- Describe the term 'Natural Acceptance'. How do you verify whether it is your natural acceptance or not? Describe the characteristics of Natural Acceptance. Explain with examples from your own life. Distinguish between Natural Acceptance and Acceptance with a few examples.
- What are the basic human aspirations and what are the requirements to fulfil them? Indicate their correct priority. Support your answer with two examples. Based on the priority distinguish between 'animal consciousness' and 'human consciousness'.
- What role does the feeling of self-regulation play in understanding prosperity? Elaborate on the feeling of self-regulation and prosperity in the context of health and prosperity with suitable examples and diagrams.
- Human being is the co-existence of the Self and the Body. What are three specific distinguishing attributes of the Self and the Body? Explain with examples. Explain how the assumption "Human Being = Body", leads to the feeling of deprivation.

- f) Why is it important to study the Self? How does it help in your day-to-day life? Explain the activities of the Self with a diagram. Describe the harmony in the Self. Explain each activity and harmony in self with the help of suitable examples.
- g) What is excellence? Is working for competition the same as working for excellence? Explain with the help of examples. Define love as per the proposal discussed in the content. How is love the complete value?
- h) Is it possible to ensure continuous happiness from favourable feelings from others (like attention from others – family members, friends, etc.)? As per the given input in UHV classes, what is the right way to ensure continuous happiness (harmony) in this context?
- i) Define 'respect' as per the proposal discussed in the class. Is it related to the body or the self? Explain various kinds of evaluation (over/under/otherwise) and their outcomes with suitable examples. Describe how differentiation is disrespect.
- j) State common humane goals for a holistic society. What is the meaning of 'universal human order'? What is its scope? How is the family order related to the universal human order?
- k) "Units in nature, other than human beings without the right understanding, are interconnected in a relationship of mutual fulfilment". Examine this statement with a few examples. Why is the human order, by and large, not mutually fulfilling for any of the four orders? Is your natural acceptance to be fulfilling for all four orders? What does the human being need to do to be mutually fulfilling for each of the four orders?
- l) How do you explain the differences found in the ethical perceptions of different cultural and religious traditions? Explain with suitable examples.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

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| Q3 | State 'happiness', 'unhappiness', and 'excitement', with suitable examples. Which one is naturally acceptable to you? How did you verify this? Is there any difference between prosperity and accumulation of wealth? Explain with few examples of both. Critically examine the prevailing notions of happiness and prosperity in society. What are the consequences of these notions? Are they in line with our basic aspirations? What can be our approach to fulfil our basic aspiration? | (16) |
| Q4 | Suppose you had some arguments with one of your close friends/relatives at times. When you are calling in the other time your friend/relative is not picking up your call. Write down the thoughts going on in your imagination. What are the bases/sources of imagination? When are you meeting him/her the next day/time, are you going to react or respond? If you are reacting, what is the basis of your imagination and if you are responding what is the basis of your imagination? What do you generally do? What is naturally acceptable to you? State the difference between 'knowing' and 'assuming' in the context of the above examples. | (16) |
| Q5 | Is the majority of the problem in our family due to lack of physical facility or lack of feelings in relationships? Is it possible to live a fulfilling life without understanding relationships? How can we understand relationships? Is it on the basis of body or self? State all the naturally acceptable nine feelings in the relationship. Explain the feelings of trust and respect with suitable real-life examples. State what is the minimum content of respect and complete content of respect. | (16) |
| Q6 | What do you mean by competence in Professional Ethics as per the proposal? Elaborate on prevalent and proposed approaches to 'Ethics and Professional Ethics' with suitable examples. Why is there a strong need to develop technologies with holistic objectives? Explain the answer with examples. | (16) |