

# END TERM EXAMINATION

SECOND SEMESTER [B.TECH] JULY 2023

Paper Code: ES-102

Subject: Programming in 'C'

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

- Q1 Answer all the following questions briefly:
- a) What is Token? What are the different types of token available in C. (3)
  - b) Enlist the significance of library functions. (3)
  - c) What are actual parameters and formal parameters? Illustrate with example. (3)
  - d) Describe header file and its usage in 'c' programming. (3)
  - e) Differentiate between put(), putchar() and puts(). (3)

## UNIT-I

- Q2
- a) Write an algorithm find angle between hour and minutes hand of a clock at a given time. (7)
  - b) Explain the bit wise AND, OR and NOT operation with suitable example. Mention the role of shift operators. (8)
- Q3
- a) What is type conversion? Explain two types of conversion with examples. (7)
  - b) Define pseudocode. Write a pseudocode to find the area of triangle when we know the lengths of all three of its sides. (8)

## UNIT-II

- Q4
- a) Write a C program that takes three coefficients (a, b and c) of a quadratic equation:  $(ax^2+bx+c)$  as input and compute all possible roots and print them with appropriate messages. (8)
  - b) What is array? Explain the declaration and initialization of one dimensional and two dimensional arrays with an example. (7)
- Q5
- a) Shivam is working on a project which requires returning multiple values from a function. But a return statement can only return single value from a function. How the function should be implemented so that multiple values can be returned by Shivam. Explain with suitable example. (8)
  - b) Write a C program to eliminate multiple spaces from a sentence and make it single. (7)

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**UNIT-III**

- Q6 a) What is a pointer? Write a C program to find the sum and mean of all elements in an array using pointer. (6)
- b) Write short note on :
- i) Dynamic memory allocation (3)
- (ii) Enumeration (3)
- (iii) Self referential structures (3)
- Q7 a) Write a program in C to count the number of words and characters in a file. (7)
- b) Define a structure data type named Time containing 3 members called hr, min and sec. Develop a program that would assign values to the individual members and display the time in the form 16:40:30 and also add structure t1 and t2. (8)

**UNIT-IV**

- Q8 a) What is meant by standard C libraries? What is the purpose of the stdio.h library in C? (5)
- b) What do you mean by Sorting? Write a program to sort a list of 'n' numbers in descending order using bubble sort. (10)
- Q9 a) Write an algorithm and develop a C program to search an integer from N numbers using binary searching technique. (5)
- b) What are some key features introduced in the C99 extensions? How do C99 extensions improve the functionality of the C programming language? (10)

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# END TERM EXAMINATION

SECOND SEMESTER [B.TECH] JULY 2023

Paper Code: BS-104

Subject: Applied Chemistry

[Batch 2021 Onwards]

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

- Q.1. **Attempt any three.** (3×5=15)
- (a) On burning 0.83 g of a solid fuel in a bomb calorimeter, the temperature of 3500 g of water increased from 26.5°C to 29.2°C. Water equivalent of calorimeter and latent heat of steam are 385.0 g and 587.0 cal/g respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific value.
  - (b) State Gibb's Phase rule. With the help of suitable example explained the terms:
    - i) Components ii) Degree of freedom iii) Phase
  - (c) What are conducting polymers? Illustrate with an example.
  - (d) Calculate the quantity of lime and soda required to soften 20,000 liters of water containing the following salts:  
CaCO<sub>3</sub> = 10.0 mg/L, MgCO<sub>3</sub> = 8.4 mg/L, CaCl<sub>2</sub> = 11.1 mg/L, MgSO<sub>4</sub> = 6.0 mg/L, SiO<sub>2</sub> = 1.2 mg/L  
Assuming the purity of lime as 90% and soda as 95%.
  - (e) Discuss sacrificial anodic protection. What is the condition for a metal to act as a sacrificial anode to iron?

## UNIT-I

- Q.2. (a) Define carbonization of coal. Explain Otto-Hoffman oven method of carbonization and recovery of by-products with diagram. (10)  
What are its advantages over earlier methods?
- (b) What do you understand by the term knocking in IC engine? (5)  
Explain its significance with chemical constituents of fuels.

## OR

- Q.3. (a) What are advantages of catalytic cracking of petroleum? Explain fixed bed catalytic method of cracking. Give its mechanism. (10)
- (b) Discuss the relative merits and demerits of solid, liquid and gaseous fuels. (5)

## UNIT-II

- Q.4. (a) What do you mean by congruent melting point? Discuss the phase diagram of a two-component system with the formation of a compound having congruent melting point. (6)
- (b) Give the preparation properties and uses of the following (3×3=9)
  - i) Phenol formaldehyde resin
  - ii) LDPE
  - iii) Nylon

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OR

Q.5. (a) Draw a labelled phase diagram of water system and discuss various curves, points, and areas present on it. Discuss super cool water in detail. (6)

(b) Write short notes on the following: (3x3=9)  
i) Liquid crystalline polymers  
ii) Electroluminescent polymers  
iii) Biodegradable polymers

**UNIT-III**

Q.6. (a) What do you understand by softening of water? Elaborate the functions of lime and soda in hot lime-soda process. (7)  
(b) What are scales and sludges and why are they formed in boilers. What are their disadvantages and how can their formation be prevented? (5)  
(c) Why is Calgon conditioning better than phosphate conditioning? (3)

OR

Q.7. (a) Describe the zeolite process used for the softening of water. What are the advantages and limitations of the process? (7)  
(b) Discuss the principle of desalination of water by reverse osmosis. (5)  
(c) What is caustic embrittlement and why is it caused? How can it be prevented? (3)

**UNIT-IV**

Q.8. (a) Discuss the role of nature of oxide formed in the oxidation corrosion. State and explain Pilling- Bedworth ratio. (5)  
(b) Define green Chemistry and explain 12 principles of green chemistry. (5)  
(c) What is stress corrosion and what factors are responsible for its occurrence? discuss some important types of stress corrosion (5)

OR

Q.9. (a) Explain the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion. (5)  
(b) Explain surface characterization technique BET and its applications. (5)  
(c) What are the various factors which influences corrosion ? (5)

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# END TERM EXAMINATION

SECOND SEMESTER [B.TECH] JULY 2023

Paper Code: BS-106

Subject: Applied Physics-II

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

- Q1 Answer the following questions:- (3x5=15)
- (a) An eigen function of an operator  $\frac{d^2}{dx^2}$ , is  $\Psi = e^{ax}$ . Find the corresponding Eigen value.
  - (b) Show that Wien's law is a special case of Planck's radiation law.
  - (c) Lattice constant of a cubic lattice is 'a'. Calculate spacing between (011), (101), (112), (111) and (100) planes.
  - (d) Explain why semiconductor acts as insulator at 0K?
  - (e) The wave function of a particle is  $\Psi = A \cos^2 x$  for interval  $-\pi/2$ . Find the value of A.

## UNIT-I

- Q2
- (a) What do you mean by particle in a box? Show that the energy of an electron in the box varied as the square of the natural numbers. (3+7=10)
  - (b) Prove quantum mechanically that particle will not exist in a box if its energy is zero. (3)
  - (c) Differentiate between  $\Psi$  and  $|\Psi^2|$  (2)
- Q3
- (a) Distinguish between phase and group velocity. Show that the de-Broglie wave group associated with moving particle travels with same velocity as the particle. (3+7=10)
  - (b) What is the physical significance of wave function? (3)
  - (c) The particle trapped in one dimensional box of length L is described by a wave function  $\Psi = x$ . Normalise the wave function between a and b. (2)

## UNIT-II

- Q4
- (a) State Planck's formula for Black body radiation and derive it from BE statistics. (8)
  - (b) If the Sun has a surface temperature of 5700K, what is the wavelength of maximum intensity of solar radiation? (4)
  - (c) Define Stefan's law. (3)
- Q5
- (a) An electron gas obeys the Maxwell-Boltzman statistics. Calculate average thermal energy (in eV) of an electron in the system at 300 K. (4)
  - (b) Distinguish between a Boson and Fermions. (3)
  - (c) What is the relative population of the first two single particle energy levels of a system of distinguishable particles if the energies of the levels is  $\epsilon_0 = 0$  and  $\epsilon_1 = kT$ ? (4)
  - (d) Discuss the Fermi-Dirac distribution with the help of the distribution function; explain the concept of Fermi level and Fermi energy. (4)

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**UNIT-III**

- Q6 (a) Why do we use X-ray to study crystal structure? (3)  
(b) State Bragg's law? How is it applied? (3)  
(c) Write short notes on: (9)
- i. Point defects
  - ii. Frenkel defects
  - iii. Schottky defects

- Q7 (a) Define the following:- (2+2+2+2=8)
- (i) Unit Cell
  - (ii) Space Lattice
  - (iii) Coordiante number
  - (iv) Miller indices
- (b) Deduce Miller indices for the plane having intercepts a, b and c at -2,  $\infty$ , -2. Also draw the plane. (4)
- (c) X- rays of wavelength  $2 \times 10^{-11}$  m suffer first order reflection from (111) crystal plane at an angle of  $45^\circ$ . What is the inter atomic spacing of the crystal? (3)

**UNIT-IV**

- Q8 (a) Distinguish between intrinsic and extrinsic semiconductors. (4)  
(b) Explain Kronig-Penney model for the motion of electron in a periodic potential. (7)  
(c) Differentiate conductor, insulator and semiconductor using energy-band diagram. (4)
- Q9 (a) Show that the Fermi energy lies midway between the conduction band and valence band for intrinsic semiconductor. (6)  
(b) Write short notes on:- (3+3+3=9)
- (i) Zener diode
  - (ii) PN junction diode
  - (iii) Photodiode

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# END TERM EXAMINATION

SECOND SEMESTER [B. TECH] JULY 2023

Paper Code: ES-108

Subject: Electrical Science

Time: 3 Hours

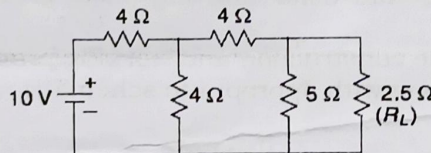
Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

- Q1 a) Defining the following terms: [3]  
 a. Active Element b. Passive Element c. Circuit vs. Network  
 b) What is resonance in the AC circuit? How is it generated in series and parallel circuit? [3]  
 c) What are the types of torques in Indicating Type measuring instruments? [3]  
 d) Interpret the different types of losses in the 1 $\phi$  Transformer [3]  
 e) List out the application of DC Motor and generator? [3]

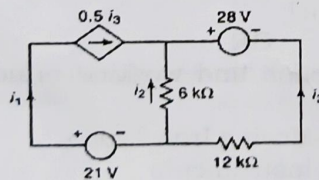
## UNIT-I

- Q2 a) State and prove the Maximum Power Transfer theorem having efficiency 50% with suitable expressions and diagram. [7.5]  
 b) Evaluate the current through load resistance  $R_L$  using Norton's Theorem. [7.5]



OR

- Q3 a) Distinguish between dependent and independent sources. How do you transform a voltage source into a current source? [7.5]  
 b) Calculate  $i_1$ ,  $i_2$ , and  $i_3$  in the given circuit [7.5]



## UNIT-II

- Q4 a) Illustrate the basic terminology used in AC Systems with the help of waveforms? Also, Differentiate single phase and three phase circuit. [7.5]

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- b) A Circuit consists of four load in series and the voltage across these loads is given by following relations in volts:  
 $v_1 = 50 \sin \omega t$  ;  $v_2 = 25 \sin(\omega t + 60^\circ)$   
 $v_3 = 40 \cos \omega t$  ;  $v_4 = 30 \sin(\omega t - 45^\circ)$   
 Calculate the supply voltage in similar form. [7.5]

**OR**

- Q5 a) Find the RMS and Average value of the following: [7.5]  
 i. Sinusoidal wave, ii. Half Rectifier Wave, iii. Triangular wave, iv. Square wave, v. Full Rectifier Wave
- b) A 230 V 50 Hz supply is applied across a resistor of 10 W in parallel with a pure inductor. The total current is 25 A. What should be the value of the frequency if the total current is 36 A? [7.5]

**UNIT-III**

- Q6 a) Explain the construction and working principle of DC motor with suitable schematic diagram. [7.5]
- b) A dc shunt generator has an induced voltage of 220 V on open circuit. When the machine is on load the voltage is 200 V. Find the load current if the field resistance is 100  $\Omega$  and armature resistance is 0.2  $\Omega$ . [7.5]

**OR**

- Q7 a) Classify the starting methods of 3- $\phi$  induction motor and also discuss the star-delta starting method in detail with suitable diagram. [7.5]
- b) Illustrate the construction and working principle of Synchronous machine along with appropriate schematic. [7.5]

**UNIT-IV**

- Q8 a) Explain the construction and working principle of Single Phase Transformer. [7.5]
- b) Compose the following phasor connections of 3 $\phi$  Transformer: [7.5]  
 (i) Yd11 (ii) Dd6 (iii) Yd1

**OR**

- Q9 a) Illustrate the construction and working principle of the following instruments. [7.5]  
 i) Attraction Type -Moving Iron Type  
 ii) Electro-dynamic instruments
- b) A transformer has its maximum efficiency of 0.975 at 20 kVA at unity p.f. During the day it is loaded as follows: [7.5]  
 10 hr: 3 kW at 0.6 p.f.  
 8 hr: 10 kW at 0.8 p.f.  
 6 hr: 20 kW at 0.9 p.f.  
 Find the all-day efficiency.

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(Please write your Exam Roll No.)

Exam Roll No. 04317702722

# END TERM EXAMINATION

SECOND SEMESTER [B.TECH] JULY 2023

Paper Code: BS-112

Subject: Applied Mathematics-II

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

- Q1. (a) Find all the point at which the following mapping is not Conformal  $w = \frac{z+\frac{1}{z}}{4z^2+z}$ . (2.5)
- (b) Split the real and imaginary part of  $i^i$ . (2.5)
- (c) Find the Laplace transform of  $t^2 e^{-2t}$ . (2.5)
- (d) Using half range sine series of function  $f(x) = 1$  for  $0 < x < \pi$ ,  
prove that  $1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots = \frac{\pi^2}{8}$ . (2.5)
- (e) Taylor series expansion of  $\frac{1}{z-2}$  in  $|z| < 1$  is..... (2.5)
- (f) Classify the type of PDE:  $\frac{\partial^2 u}{\partial x^2} + 2 \frac{\partial^2 u}{\partial x \partial y} + 5 \frac{\partial^2 u}{\partial y^2} = 0$ , whether it is parabolic, elliptic or hyperbolic? (2.5)

## UNIT-I

- Q2. (a) Find all the values of  $(-1 + \sqrt{3}i)^{\frac{3}{2}}$ . (7)
- (b) Verify that the function  $u(x, y) = x^3 y - xy^3$  is harmonic and find the harmonic conjugate of  $u(x, y)$  to express the function  $f(z) = u + iv$  as an analytic function. (8)
- Q3. (a) Evaluate the integral  $\oint_C \frac{e^{2z}}{(z-1)(z-2)} dz$  along the curve  $C$ , where  $C$  is a circle  $|z| = 3$ . (7)
- (b) Integrate the function  $f(z) = \bar{z}$  along the curve  $C$ , where  $C$  is the square with vertices  $z = 0, 2, 2i, 2 + 2i$ . (8)

## UNIT-II

- Q4. (a) Find the bilinear transformation or Mobious transformation which maps  $1, i, 1$  of the  $z$ -plane onto  $1, i, -1$  of the  $w$ -plane respectively. Also find the fixed points or invariant points. (8)

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(b) Find the singular points, type of singularities and the corresponding residues of the function  $f(z) = \frac{1}{(z^2-1)^2}$ . (7)

Q 5.(a) Sketch and graph the given region:  $|z| \leq \frac{1}{2}$ ,  $-\frac{\pi}{8} < \text{Arg}(z) < \frac{\pi}{8}$ , and its image under the given mapping:  $w = z^2$ . (7.5)

(b) Prove that the integral  $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx = \frac{\pi}{3}$ . (7.5)

UNIT-III

Q 6. (a) Using Laplace transform solve the ordinary differential equation

$y'''(t) + 2y''(t) - y'(t) - 2y = 0$ , with conditions  $y(0) = y'(0) = 0$ , and  $y''(0) = 6$ . (8)

(b) Find the inverse Laplace transform of  $\log\left(\frac{s+1}{s-1}\right)$ . (7)

Q 7.(a) Find the Fourier series to represent the function  $f(x) = x^2$  in the interval  $(-\pi, \pi)$ . (7.5)

(b) Find the Fourier transform of  $f(x) = \begin{cases} 1 & \text{for } |x| < 1 \\ 0 & \text{for } |x| > 1 \end{cases}$ . Hence evaluate  $\int_0^{\infty} \frac{\sin x}{x}$ . (7.5)

UNIT-IV

Q 8. (a) Find the temperature in a laterally insulated bar of length  $L$  whose ends are kept at temperature zero, assuming that the initial temperature is

$$f(x) = \begin{cases} x & \text{for } 0 < x < \frac{L}{2} \\ L-x & \text{for } \frac{L}{2} < x < L \end{cases} \quad (8)$$

(b) A tightly stretched string with fixed end points  $x = 0$  and  $x = l$ , is initially in a position given by  $y = \sin^3\left(\frac{\pi x}{l}\right)$ . If it is released from rest from this position, find the displacement  $y(x, t)$ . (7)

Q 9. (a) Solve the Laplace equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ , subject to the conditions

$$u(0, y) = u(l, y) = u(x, 0) = 0 \text{ and } u(x, a) = \sin\frac{n\pi x}{l}. \quad (8)$$

(b) Solve the equation  $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ , with boundary condition  $u(x, 0) = 3\sin(n\pi x)$ ,

$$u(0, t) = 0 \text{ and } u(1, t) = 0, \text{ where } 0 < x < 1, t > 0. \quad (7)$$

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(Please write your Exam Roll No.)

Exam Roll No. 0431770272  
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# END TERM EXAMINATION

SECOND SEMESTER [B. TECH] JULY-2023

Paper Code: HS-114

Subject: Communication Skills

Time: 3 Hours

Maximum Marks :75

Note: Attempt five questions in all including Qno.1 which is compulsory.  
Internal choice is indicated in the questions.

- Q1 Do as directed (**Attempt any five**) (3×5=15)
- (a) List any four characteristics of good communication.
  - (b) Define the terms Homophones and Homonyms. Give examples for the same.
  - (c) Why is appearance important for professional communication? Provide example.
  - (d) What are conditional clauses? Give examples for the same.
  - (e) Differentiate between a Group Discussion and a Debate.
  - (f) "A postscript is not always an afterthought in a letter." Comment.
- Q2 (a) Differentiate between verbal and non-verbal communication. What are the various features of non-verbal communication? (7.5)
- (b) In non-verbal communication, explain the term Paralanguage, Chronemics and Haptics. (7.5)
- OR**
- Q3 (a) What are the various kinds of Group Discussion? What are the predominant features of G.D, explain? (7.5)
- (b) What are some common barriers to communication, and how can they impact effective communication in a professional setting? (7.5)
- Q4 (a) What are the etiquettes needed for Business Communication? (7.5)
- (b) What is Grapevine? Explain briefly the importance of informal communication in an business organisation. (7.5)
- OR**
- Q5 (a) Define Indianism. Discuss British and American English as different varieties of English. (7.5)
- (b) i) Give one word substitution for the following: (2)
1. That which cannot be read
  2. Government by the officials.
- ii) Differentiate between Thesaurus and Dictionary. (2.5)
- iii) Differentiate the meaning of the following words by framing the sentences: (3)
- Diseased, Deceased                      Elicit, Illicit                      Pray, Prey
- Q6 (a) You have sent your resume for a job of your choice and were interviewed a week ago but you did not get a response from the HR manager. Write a follow-up letter to know the result of your interview. Invent the necessary details. (7.5)
- (b) Draft a memorandum announcing about company's Annual Award Ceremony. Invent necessary details. (7.5)

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**OR**

- Q7 (a) What is the co-relation between Audience Analysis and effective Speech. (7.5)  
 (b) Write a letter-style report for submission to the Board of Directors regarding the market potential of a new brand of electronic equipment. (7.5)

- Q8 (a) Define 'active listening'. Explain in detail guidelines for effective listening. (8)  
 (b) Fill in the blanks with appropriate verbs: (7)  
 i. Where's my wallet? It was on the table. Probably, somebody \_\_\_\_\_ (keep) it somewhere else.  
 ii. The explorer \_\_\_\_\_ (explain) the latest discovery regarding pyramids in Egypt in his research.  
 iii. I \_\_\_\_\_ (work) hard for my GRE test these days.  
 iv. It \_\_\_\_\_ (rain) frequently in London.  
 v. By the time the troops arrive, the army on the border \_\_\_\_\_ (spend) several weeks waiting.  
 vi. The music band \_\_\_\_\_ (display) a stupendous show this time.  
 vii. The leader \_\_\_\_\_ (vanish) from the city, when protests began against him on the streets.

**OR**

- Q9 (a) What are the different types of listening? Provide example of each type. (8)  
 (b) Rectify the errors in the following sentences: (3)  
 i. Everyone of the plane's crew were killed.  
 ii. Scarcely had he gone than I remembered his letter.  
 iii. Not only England, but all the world feel the loss.  
 (c) Do as directed: (4)  
 Do not abuse anyone. (Change the voice)  
 He made a promise, "I will come, if I can." (Change the form of narration)

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# END TERM EXAMINATION

SECOND SEMESTER [B.TECH] JULY 2023

Paper Code: ES-114

Subject: Engineering Mechanics

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit. Assume suitable missing data (if any).

**Q1 Short questions:-**

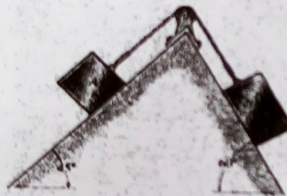
(1.5x10=15)

- (a) State the principle of transmissibility of forces.
- (b) Define couple and explain its properties.
- (c) Define free body diagram with one suitable example.
- (d) Briefly explain the significance of moment of inertia.
- (e) Define centroid and write the centroid of quadrant of an arc of radius R.
- (f) Write any two differences between truss and frames.
- (g) Write two assumptions made for analyzing the perfect truss.
- (h) Define Coulomb's Law of Friction.
- (i) State D'Alembert's Principle.
- (j) Define instantaneous centre of rotation.

**UNIT-I**

- Q2 (a) If a block A weighs 1.5 kg, then, determine the largest mass of block B without causing motion of the system as shown in Fig. 1. The coefficient of static friction between the blocks and inclined planes is 0.2. (9)

Fig. 1



- (b) Derive the expression to determine the mass moment of inertia of circular disc of radius R, thickness t and mass M about its axis of rotation. (6)

- Q3 (a) A system of parallel forces is acting on a rigid bar as shown in Fig. 2. Reduce the system to (i) a single force (ii) a single force and a couple at A (iii) a single force and a couple at B. (9)

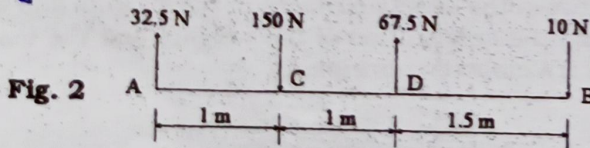


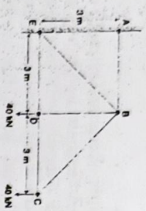
Fig. 2

- (b) Derive the expression for finding the centroid of a triangle of base 'b' and height 'h' from its base. (6)

UNIT-II

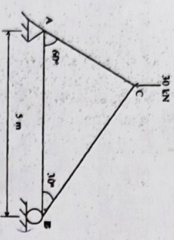
- Q4 (a) A body of weight 500 N is pulled up an inclined plane, by a force of 350 N. The inclination of the plane is  $30^\circ$  to the horizontal and the force is applied parallel to the plane. Determine the coefficient of friction. (6)
- (b) Find the forces in AB, BE and DE members of the given truss (Fig. 3) and identify nature of forces in the members. (9)

Fig. 3



- Q5 (a) Determine the forces in magnitude and nature in all members of truss system as shown in Fig. 4 using method of joints. (9)
- (b) Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 rpm. The coefficient of friction between the belt and the pulley is 0.25, angle of lap  $160^\circ$  and maximum tension in the belt is 2.5 kN. (6)

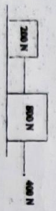
Fig. 4



UNIT-III

- Q6 (a) A body of 5 kg mass is initially at rest on a rough horizontal surface ( $\mu = 0.2$ ) and is acted upon by a 20 N pull applied horizontally. Calculate: (8)
- (i) The work done by the net force on the body in 5 seconds.
- (ii) Change in the kinetic energy of the body in 5 seconds.
- (b) A stone is dropped into a well is heard to strike the water after 4 seconds. Find the depth of well, if the velocity of sound is 350 m/sec. (7)
- Q7 (a) Two weights 800 N and 200 N are connected by a thread and move along a rough horizontal plane under the action of a force 400 N applied to the first weight of 800 N as shown in Fig. 5. The co-efficient of friction between the sliding surfaces of the weights and the plane is 0.3. Determine the acceleration of the weights and the tension in the thread using D'Alembert's principle. (9)

Fig. 5



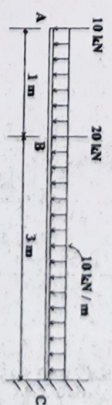
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UNIT-IV

- (b) State and prove the law of conservation of energy. (6)
- Q8 (a) Two ships leave a port at the same time. The first moves in North-West direction at 50 km/hr and second at 40 km/hr in  $35^\circ$  South of West direction. Find the relative velocity of second ship with respect to first. Also find the distance between them after 25 minutes. (7)
- (b) Define statically determinate beams. Also write the types of beams with suitable diagrams. (8)
- Q9 (a) A link AB is moving in a vertical plane. At certain instant, when the link is inclined at  $60^\circ$  to the horizontal, the point A is moving horizontally at 2 m/sec, while B is moving in a vertical direction. Find the velocity of B. (5)
- (b) Construct shear force and bending moment diagrams for the cantilever beam as shown in Fig. 6. (10)

Fig. 6



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