

240FIA1400.

"Do not write anything on question-paper except Roll Number, otherwise it shall be deemed as an act of indulging in unfair means and action shall be taken as per rules."

Roll No. 240FIA1400

BE I

BASIC ELECTRONICS

FIRST B.E. EXAMINATION - 2024

(SECTION - A,B,C & D)

(II SEMESTER)

FCC36A (ECE)/ECE155 A : BASIC
ELECTRONICS

Time - Three Hours

Maximum Marks - 100

- Note:- (i) Attempt any **Five** questions.
(ii) Answer should be to the point.
(iii) All questions carry equal marks.

- 1.(a) Explain the construction and characteristics of carbon
composition, wire wound and film resistors. 12
(b) Explain the operating principles and electrical
characteristics of Capacitors 8
2.(a) Draw and explain the working of a Bridge rectifier with
input and output waveforms. Calculate ripple factor,
Average d.c voltage, RMS current and PIV. 12

(b) What is regulated power supply? Explain the operation of Zener diode regulator. 8

3.(a) Explain the principle and operation of negative feedback amplifier? What are the advantages of negative feedback amplifier 10

(b) Define h-parameter of a transistor. Draw and explain the equivalent circuit of BJT. 10

4.(a) Explain with the help of a neat diagram working and characteristic curve of Ramp type digital voltmeter. 10

(b) Explain the construction, working and characteristics of n-channel JFET. 10

5.(a) If 20KHz signal is modulated with the help of 2000 KHz carrier, find the range of the frequency which is present in this AM wave and also find the oscillator frequency of superheterodyne receiver for demodulation of this signal ($IF = 455KHz$) 5

(b) What is Amplitude Modulation? Why Modulation is necessary for radio communication? 5

(c) With the help of a neat block diagram explain the working of a CRO and describe the method of measurement of phase and frequency using CRO. 10

6.(a) Attempt any two, describe in details with neat diagrams.

$10 \times 2 = 20$

- (i) SCR
- (ii) Types of Transistor Biasing
- (iii) Hartley oscillator
- (iv) Photodiode

7.(a) Draw the input and output characteristics of common emitter npn transistor configuration with proper labels.
For the circuit shown in fig. 7 (a). Find out I_b , I_c , V_c
($\beta=120$)

10

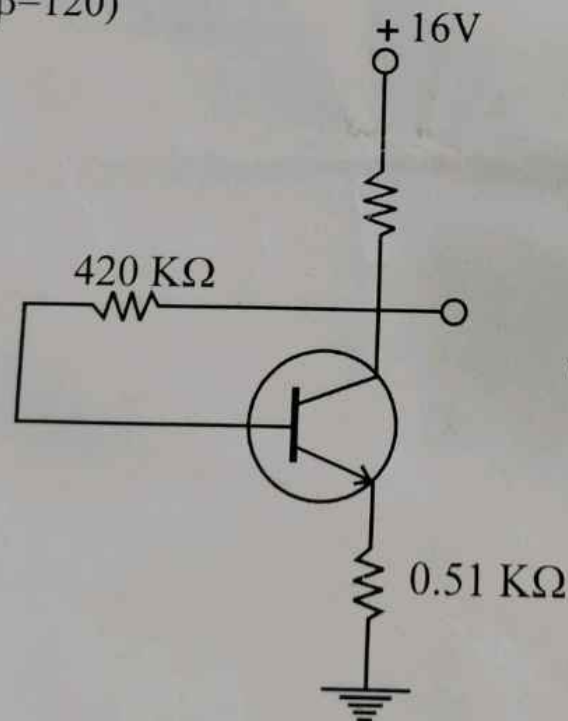


Fig. 7 (a)

7.(b) Explain semi conductor with its types why S_i is preferred over G_e ?

10

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Roll No. 24VF1A1387

BE I

Elem. of Mech. Engg.

FIRST B.E. EXAMINATION - 2024

(SECTION - A, B, C & D)

(II SEMESTER)

**FCC35A (ME)/ ME154 A: ELEMENTS OF
MECHANICAL ENGINEERING**

Time - Three Hours

Maximum Marks - 100

Note:- (i) Attempt any **Five** questions.

(ii) Answer should be to the point.

(iii) All questions carry equal marks.

(iv) Use of Steam table & Mollier chart is allowed.

- ✓ (a) Define internal energy and prove that it is a property of the system. 5
- (b) Derive the general energy equation for steady flow process and apply steady flow energy equation to the 'Turbine' and calculate the work output. 5

(c) Define first law of thermodynamics and explain the perpetual motion machine of the first kind. 5

(d) Show that when 1 kg of a perfect gas is expanded through volume ratio 'r' according to the law $PV^n = C$, the change in specific entropy is given by

$$\Delta S = (C_p - nC_v) \times \ln(cr) \quad 5$$

2. ~~10~~ (a) State the second law of thermodynamics as per Kelvin-Planck statement and Clausius statement and prove that both the statements are equivalent to each other. 5

(b) Derive the expression for the efficiency of Carnot cycle. Discuss the limitation of Carnot cycle as why it cannot be used in practice. 5

(c) A quantity of gas occupies a volume of 0.3 m^3 at a pressure of 1 bar and a temperature of 20°C . The gas is compressed isothermally to a pressure of 5 bar and then expanded adiabatically to the initial volume. Determine for this quantity of gas:

- (i) Heat received or rejected during the compression.
- (ii) The change of internal energy during the expansion. 10

3. (a) Explain Otto and Diesel cycle with PV and TS diagram and write the assumptions made to calculate air standard efficiency. 5

- (b) A refrigeration cycle operating between two reservoirs receives energy Q_2 from cold reservoir at temperature $T_2 = 250\text{K}$ and rejects energy Q_1 to hot reservoir at temperature $T_1 = 300\text{K}$. For each of the following cases determine whether the cycle operates reversibly, irreversibly or impossible.
- (i) $Q_2 = 1000\text{ KJ}$ and $W = 400\text{ KJ}$
 - (ii) $Q_2 = 2000\text{ KJ}$ and $Q_1 = 2200\text{ KJ}$ 5
 - (c) A thermodynamic system operates under steady flow conditions, the fluid entering at 2 bar and leaving at 10 bar. The entry velocity is 36 m/s and exit velocity is 12m/s. During the process 25000 KJ/h of heat from an external source are supplied and the increase in enthalpy is 5 KJ/Kg. The exit point is 25m above the entry point. Calculate the flow of work from the system in KN for a flow of 45kg/min. 10
4. (a) For reversible non-flow process with steam draws the following processes on temperature - entropy chart and compute non-flow energy equation.
- (i) Constant volume process
 - (ii) Constant temperature ie isothermal process. 5

- (b) What are limitations of using separating calorimeter and throttling calorimeter separately for estimation of dryness fraction of steam. 5
- (c) 1 Kg of steam at 20 bar, and 250°C undergoes a reversibly isothermal process to a pressure of 30 bar. Calculate the heat flow stating whether it is supplied or rejected. Also sketch the process on T-S chart. 10
5. (a) Explain the construction and working of a four stroke CI engine with suitable sketches. 5
- (b) Sketch and describe battery operated ignition system for a six cylinder petrol engine and write the possible firing order for it. 5
- (c) A four cylinder two stroke cycle petrol engine has 75mm bore and 90mm stroke, operates on the constant volume cycle and has a compression ratio of 6:1. The indicated thermal efficiency and indicated specific fuel consumption are 28.16% and 0.29 kg/kwH respectively. When running at 40 rps engine develops a 'bmep' of 360 kPa and uses 9.2 kg of fuel per hours of cv 44000 kJ/kg. Calculate the following
- (i) air standard efficiency

- (ii) Mechanical efficiency and
- (iii) Brake specific fuel consumption (bsfc) 10
6. (a) Explain the following processes 2X5=10
- ~~(i)~~ up setting
 - ~~(ii)~~ drawing
 - (iii) Tempering
 - (iv) Normalizing
 - (v) Brazing
- Last* (b) Explain the green sand casting with suitable sketch. 5
- Last* (c) List any five tools used in foundry with sketches and also write their uses during metal moulding. 5
7. *Last* (a) Explain the procedure of manual arc welding stating the setting of transformer. 5
- (b) Describe any five mechanical properties of ferrous materials. 5
- (c) Briefly explain the effect of alloying elements in improving mechanical or other properties of steel. 5
- (d) Write short notes on following: 2.5X2=5
- (i) Bearing material.
 - (ii) Hardening of steel

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BE I

Roll No. 2408191400

Math - II

FIRST B.E. EXAMINATION - 2024

(II SEMESTER)

(COMMON FOR ALL SECTIONS)

FCC24A (MA)/ MA153 A : MATHEMATICS - II

Time - Three Hours

Maximum Marks - 100

- Note:- (i) Attempt any FIVE questions.
(ii) Answer should be to the point.
(iii) All questions carry equal marks.

SECTION - A

1. (a) Solve:

$$(3x+2y^2)ydx + 2x(2x+3y^2)dy=0$$

(b) Solve:

$$4yp^2+2px-y=0$$

(c) Solve:

$$\frac{dy^3}{dx^3} + \cos x \frac{dy^2}{dx^2} - 2 \sin x \frac{dy}{dx} - y \cos x = \sin 2x$$

J-1830

1

(Contd.)

2. (a) Solve:

$$(D-1)^2(D^2+1)^2y = \sin^2 \frac{1}{2}x + e^x \quad 10$$

(b) Solve by the method of variation of parameters:

$$(x+2)\frac{d^2y}{dx^2} - (2x+5)\frac{dy}{dx} + 2y = (1+x)e^x \quad 10$$

3. (a) Solve: $(x^2D^2 - 3xD + 1)y = \frac{\log x \cdot \sin(\log x) + 1}{x}$ 10

(b) Solve by the method of variation of parameters: 10

$$\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$$

SECTION - B

4. (a) A uniform rod rests in a vertical plane within a fixed hemispherical bowl whose radius is equal to the length of the rod. If μ is the coefficient of friction between the rod and the bowl, show that in limiting equilibrium the inclination of the rod to the horizontal is $\tan^{-1} \left[\frac{4\mu}{3-\mu^2} \right]$. 10

(b) Show that the length of an endless chain which will hang over a circular pulley of radius a so as to be in contact with two thirds of the circumference of the pulley is

$$a \left[\frac{4\pi}{3} + \frac{3}{\log(2+\sqrt{3})} \right] \quad 10$$

5. (a) Five weightless rods of equal lengths are jointed together so as to form a rhombus ABCD with one diagonal BD. If a weight w be attached to C and the system be suspended from A, show that there is a thrust in BD equal to $\frac{w}{\sqrt{3}}$. 10

(b) Two rough particles connected by a light string rest on an inclined plane. If their weights and corresponding coefficients of friction are w_1, w_2 and μ_1, μ_2 respectively, show that greatest inclination of the plane for equilibrium is $\tan^{-1} \left[\frac{\mu_1 w_1 + \mu_2 w_2}{w_1 + w_2} \right]$ 10

6. (a) If the tangential and normal components of the acceleration of a moving particle are always equal, prove that its velocity varies as e^ψ . 10

(b) A particle rests in equilibrium under the attraction of two centers of force which attract directly as the distance, their intensity being μ and μ_1 ; the particle is slightly displaced towards one of them. Show that the time of a small oscillation is $\frac{2\pi}{\sqrt{\mu + \mu_1}}$ 10

SECTION - C

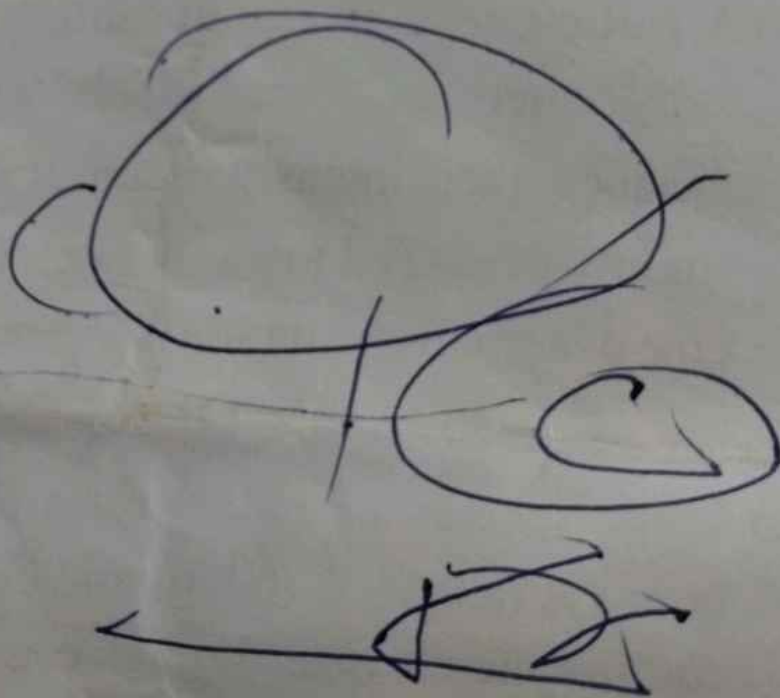
7. (a) Three spheres of radius r_1, r_2, r_3 have their centers at points A $(a, 0, 0)$, B $(0, b, 0)$ and C $(0, 0, c)$ respectively. A fourth sphere passes through origin and the points A, B, and C. Find the radical center of these four spheres and if $r_1^2 + r_2^2 + r_3^2 = a^2 + b^2 + c^2$, prove that radical center lies on the plane $ax + by + cz = 0$. 10

(b) Show that the cone whose vertex is at the origin and which passes through the curve of intersection of the sphere $x^2 + y^2 + z^2 = 3a^2$ and any plane at distance a from the origin has three mutually perpendicular generators. 10



8. (a) Obtain the equation of right circular cylinder described on the circle through the three points $(1,0,0)$, $(0,1,0)$ and $(0,0,1)$ a guiding circle. 10

(b) Show that the equation of a cone of second degree which passes through the axes of co-ordinates is $fyx + gzx + hxy = 0$. 10



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BE I

Roll No. 23VE1A1387

Engg. Phy.

FIRST B.E. EXAMINATION - 2024

(SECTION - A, B, C & D)

(II SEMESTER)

**FCC23A (PHY)/PHY152A: ENGINEERING
PHYSICS**

Time - Three Hours

Maximum Marks - 100

- Note:- (i) Attempt any **FIVE** questions.
(ii) Answer should be to the point.
(iii) All questions carry equal marks.

SECTION - A

1. (i) Describe Scalar and Vector field. How can they be represented graphically? 8
(ii) State and prove - Stoke's Curl theorem.
(iii) A vector field is represented by the following equation.

$$\vec{A} = \hat{i} x^2 yz - \hat{j} 2xz^3 + \hat{k} xz^2 \quad 6$$

Calculate the values of the partial derivatives.

4

$$\frac{\partial \vec{A}}{\partial x}, \frac{\partial \vec{A}}{\partial y} \text{ and } \frac{\partial \vec{A}}{\partial z}$$

2. (i) What do you understand by displacement current?
Derive all maxwell equations in integral and differential form.

10

- (ii) What is time constant of RC - circuit? Show graphically and discuss the variation of current with respect to time in charging and discharging process.

8

- (iii) How much electric flux will come out through a surface $\vec{S} = 10\hat{j}$ kept in an electric field $\vec{E} = 2\hat{i} + 4\hat{j} + 7\hat{k}$?

2

3. (i) Describe Newton's Ring method for measuring the wavelength of monochromatic light and the refractive index of a liquid. Give the necessary theory.

10

- (ii) In Newton's rings experiment, the diameter of 15th ring was found to be 0.590 cm and that of the 5th ring was 0.336 cm. If the radius of plano convex lens is 100cm. Calculate the wavelength of light used.

4

- (iii) Show that the diameter of the dark Newton's ring is proportional to the square root of natural numbers.

6

4. (i) Give the construction and theory of plane transmission grating and explain the formation of spectra by it.

10

- (ii) Calculate the resolving power of a telescope whose lens is of diameter 200 inches. ($\lambda = 5.5 \times 10^{-5}$ cm).

4

- (iii) Describe a polarimeter and explain how it is used to measure the strength of sugar solution.

6

J-1834

SECTION - B

5. (i) Establish Einstein's mass energy relation. 8
- (ii) A rocket ship is 50 meter long. When it is on flight its length appears to be 49.5 meters to be an observer on the ground. Find the speed of rocket. 6
- (iii) What is Planck's hypothesis? Derive the Planck's radiation formula. 6
6. (i) LASER action is sometimes called 'inverted absorption'. Explain in what situation may A/B be small enough for laser action. 12
- (ii) Explain construction and working of He - Ne Laser. 8
7. (i) Derive Schrodinger time dependent and time independent wave equation. Give physical significance of wave function. 12
- (ii) Calculate Eigen value and Eigen function of particle in a one dimensional box. 8
8. (i) Derive Law equation for X-ray diffraction. 6
- (ii) Compare Maxwell-Boltzmann, Bose - Einstein and Fermi dirac statistics. 6
- (iii) Write short notes on following:- 4+4
- (a) GM counter
 - (b) Optical Fiber

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Roll No. 24UFI01400

BE I

Intro. Comp. Prog.

FIRST B.E. EXAMINATION - 2024

(SECTION - A, B, C & D)

(II SEMESTER)

FCC34A(CSE)/CSE151 A: INTRODUCTION TO
COMPUTER PROGRAMMING

Time - Three Hours

Maximum Marks - 100

- Note:- (i) Attempt any **Five** questions.
(ii) Answer should be to the point.
(iii) All questions carry equal marks.

1. (a) Determine the decimal numbers represented by the following numbers.

(i) $(101101.10101)_2 = (\quad)_{10}$

(ii) $(6327.4051)_8 = (\quad)_{10}$

(iii) $(2DEF.CA6)_{16} = (\quad)_{10}$

(iv) $(A72E.BF85)_{16} = (\quad)_{10}$

(v) $(2346.3322)_8 = (\quad)_{10}$ $4 \times 5 = 20$

2. (a) Add the following numbers:- 10

— (i) $(1001010.11101)_2 + (1110111.011111)_2$

(ii) $(43435.1123)_8 + (221114.1112)_8$

(iii) $(ABC23.AA23)_{16} + (CCDD5.4462)_{16}$

(iv) $(1111111.1111)_2 + (101010101.1111)_2$

(b) What is an operating system? Write down the difference between compiler and interpreter. 10

3. (a) Write down the C programming basic data types, also write down the size of each data type in bytes and format specifier. 10

(b) Write down the arithmetic operators, relational operators, logical operators and bitwise operators. Give the example of each operator. 10

4. (a) Draw the flow charts of while loop, do while loop and for loop. Give the example of each loop with C programming syntax. 10

(b) Write down the syntax of if else switch, break, continue and go to statement, also draw the flow chart of each statement. 10

5. (a) (i) Write a C program to count number of digits in an integer.

(ii) Write a C program to check whether a number is prime or not. 10

- (b) Explain the following C programming storage classes, with storage place default value, scope of storage class and lifetime of storage class.
- (i) Automatic
 - (ii) External
 - (iii) Static
 - (iv) Register
- 10
6. (a) Compare the standard library function used in C programming and user-defined function. How user defined function works? Write a function to add two numbers.
- 10
- (b) What is a Multi-dimensional Arrays? Write C program to add two arrays of numbers of size [3] [4].
- 10
7. (a) What is a Pointer? How can we pass an array to function? Write down the line of C code to pass an array to function.
- 10
- (b) What is structure in C Programming? How can we define a structure for the customer having a Saving Bank Account in a bank?
- 10
8. Write short notes on any four:-
- (a) Conditional operators in C.
 - (b) Hexa-decimal to Binary Conversion.
 - (c) Operations on strings.
 - (d) Security Threats and vulnerabilities
 - (e) Cyber Crimes.
- 4X5=20