



**Module-3**

- 5 a. Find the constants 'a' and 'b' such that  $\vec{F} = (axy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (bxz^2 - y)\hat{k}$  is irrotational. Also find a scalar potential  $\phi$  such that  $\vec{F} = \nabla\phi$ . (06 Marks)
- b. Find the directional derivative of  $\phi = x^2yz + 4xz^2$  at the point (1, -2, -1) along the vector  $\hat{A} = 2\hat{i} - \hat{j} - 2\hat{k}$ . (05 Marks)
- c. A particle moves along the curve  $\vec{r} = 2t\hat{i} + (t^2 - 4t)\hat{j} + (3t - 5)\hat{k}$ . Find the components of velocity and acceleration in the direction of the vector  $\vec{A} = \hat{i} - 3\hat{j} + 2\hat{k}$  at  $t = 2$ . (05 Marks)

OR

- 6 a. For any scalar field  $\phi$  and any vector field  $\vec{A}$ , prove that  $\nabla \times (\phi\vec{A}) = \phi(\nabla \times \vec{A}) + (\nabla\phi) \times \vec{A}$ . (06 Marks)
- b. If  $\vec{F} = \text{grad}(x^3y + y^3z + z^3x - x^2y^2z^2)$ , find  $\text{div}(\vec{F})$  and  $\text{curl}(\vec{F})$  at the point (1, 2, 3). (05 Marks)
- c. Find the angle between the tangents to the curve  $x = t^2 + 1$ ,  $y = 4t - 3$ ,  $z = 2t^2 - 6t$  at  $t = 1$  and  $t = 2$ . (05 Marks)

**Module-4**

- 7 a. Obtain the reduction formula for  $\int_0^{\pi/2} \cos^n x dx$ . (06 Marks)
- b. Solve  $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$  (05 Marks)
- c. Find the orthogonal trajectories of the family of ellipses  $\frac{x^2}{a^2} + \frac{y^2}{a^2 + \lambda} = 1$ . (05 Marks)

OR

- 8 a. Evaluate  $\int_0^a x\sqrt{ax - x^2} dx$ . (06 Marks)
- b. Solve  $\frac{dy}{dx} + \frac{y}{x} = y^2x$ . (05 Marks)
- c. The temperature of a body drops from  $100^\circ\text{C}$  to  $75^\circ\text{C}$  in 10 minutes when the surrounding air is at  $20^\circ\text{C}$ . what will be its temperature after half an hour? When will be the temperature be  $25^\circ\text{C}$ ? (05 Marks)

**Module-5**

- 9 a. Show that the linear transformation :  $y_1 = 2x_1 + x_2 + x_3$ ;  $y_2 = x_1 + x_2 + 2x_3$ ;  $y_3 = x_1 - 2x_3$  is regular. Also, determine the inverse transformation. (06 Marks)
- b. Find the dominant eigen value and the corresponding eigen vector of the matrix

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

using Rayleigh's power method. Choose  $[1, 0, 0]^T$  as the initial vector and perform five iterations. (05 Marks)

- c. Solve the following system of equation by Gauss elimination method:

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

(05 Marks)

OR

- 10 a. Employ the Gauss-Seidal method to solve the following system:

$$9x - y + 2z = 9$$

$$x + 10y - 2z = 15$$

$$-2x + 2y + 13z = 17$$

Choose (1, 1, 1) as the starting solution and carry out four iterations.

(06 Marks)

- b. Reduce the following matrix to diagonal form:

$$A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$$

(05 Marks)

- c. Obtain the canonical form of the quadratic form  $3x^2 + 2y^2 - z^2 + 12yz + 8zx - 4xy$ .

(05 Marks)

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# CBCS SCHEME

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15PHY12/22

## First/Second Semester B.E. Degree Examination, Jan./Feb.2021 Engineering Physics

Time: 3 hrs.

Max. Marks: 80

Note:1. Answer any FIVE full questions, choosing ONE full question from each module.

Physical Constants : Mass of electron ( $m_e$ ) =  $9.11 \times 10^{-31}$  kg

Velocity of light in air or vacuum ( $C$ ) =  $3 \times 10^8$  ms<sup>-1</sup>

Planck's constant ( $h$ ) =  $6.63 \times 10^{-34}$  JS

Charge on electron ( $e$ ) =  $1.602 \times 10^{-19}$  C

Boltzmann constant ( $k$ ) =  $1.38 \times 10^{-23}$  JK<sup>-1</sup>

Avagadro number ( $N_A$ ) =  $6.023 \times 10^{23}$  mole<sup>-1</sup>

### Module-1

- Explain the assumptions of quantum theory of radiation. Deduce Rayleigh-Jean's law and Wein's law from Planck's law. (06 Marks)
  - Define phase velocity and group velocity. Build the relation between group velocity and particle velocity. (06 Marks)
  - The ground state energy of an electron in an infinite well is  $2.5 \times 10^{-3}$  eV. What will be the ground state energy if the width of the wall is doubled? (04 Marks)

OR

- Solve the Schrodinger wave equation and derive expression for energy values in the case of particle in a box. (06 Marks)
  - What is wave function? Explain the properties of wave function. (06 Marks)
  - A spectral line of wavelength 4500 Å has a width of  $9 \times 10^{-5}$  Å. Evaluate the minimum time spent by the electrons in the upper energy state between the excitation and de-excitation process. (04 Marks)

### Module-2

- Discuss the dependence of Fermi factor on temperature and energy. (06 Marks)
  - Define Meissener's effect and explain the application of superconductivity in Maglev vehicles. (06 Marks)
  - Calculate the drift velocity of electrons in a metal of thickness 1 mm across which a potential difference of 1 volt is applied. Calculate thermal velocity at temperature of 300 K. (04 Marks)

OR

- Distinguish between Type – I and Type – II superconductors. (06 Marks)
  - Develop the expression for electrical conductivity based on free electron theory of metals. (06 Marks)
  - The electron and hole mobilities of silicon are  $0.164$  m<sup>2</sup>V<sup>-1</sup>s<sup>-1</sup> and  $0.05$  m<sup>2</sup>V<sup>-1</sup>s<sup>-1</sup> respectively. If the electron density is  $1.5 \times 10^{16}$  electrons m<sup>-3</sup>. Calculate resistivity of silicon. (04 Marks)

**Module-3**

- 5 a. Derive the expression for the angle of acceptance and numerical aperture in an optical fiber. (06 Marks)
- b. Explain the construction and working of a semiconductor LASER. (06 Marks)
- c. A pulsed LASER has an output power of 1.5 mW per pulse and pulse duration is 25 nS. The number of photons emitted per pulse is estimated to  $1.047 \times 10^8$ . Find the wavelength of emitted LASER. (04 Marks)

OR

- 6 a. Derive the expression for energy density in terms of Einstein's A & B coefficients. (06 Marks)
- b. Discuss the mechanisms involved in the attenuation of signal in optical fibers. (06 Marks)
- c. An Optic fiber of 0.6 km long has input power of 120 mW emerging out with a power of 90 mW. Find the attenuation in the fiber. (04 Marks)

**Module-4**

- 7 a. Derive the expression for Interplanar spacing in a crystal. (05 Marks)
- b. Discuss the seven crystal systems taking into account the basis vectors and interfacial angles. (07 Marks)
- c. Find the Miller indices of a set of parallel planes which make intercepts in the ratio  $2b : 7c$  and parallel to x-axis. (04 Marks)

OR

- 8 a. Estimate the atomic packing factor for simple cubic, bcc and fcc. (06 Marks)
- b. Explain the crystal structure of diamond with suitable diagrams. (06 Marks)
- c. X-rays are diffracted in the first order from (1 1 0) plane of a crystal with lattice constant 3.036 Å at a glancing angle of  $9.6^\circ$ . Calculate the wavelength of X-rays. (04 Marks)

**Module-5**

- 9 a. Construct and label Reddy shock tube and explain its working using suitable diagram. (06 Marks)
- b. Briefly discuss arc discharge method and pyrolysis method to obtain carbon nanotubes. (06 Marks)
- c. Explain the density of states in 1D, 2D and 3D structures using graphical representation. (04 Marks)

OR

- 10 a. Construct Scanning Electron Microscope (SEM) and explain its principle and working using suitable diagram. (06 Marks)
- b. Explain the ball milling method and sol gel method to produce nanomaterials. (06 Marks)
- c. Distinguish between acoustic, ultrasonic, subsonic and supersonic waves. (04 Marks)

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# CBCS SCHEME

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15PCD13/23

First/Second Semester B.E. Degree Examination, Jan./Feb. 2021

## Programming in C and Data Structures

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain the structure of C program with an example. (06 Marks)
- b. What is type conversion? Explain the two types of type conversions with examples. (06 Marks)
- c. What is pseudocode? Explain with examples. (04 Marks)

OR

- 2 a. Explain the different data types supported in C language with example. (08 Marks)
- b. List and explain the different types of operators in C language. (08 Marks)

### Module-2

- 3 a. Explain the syntax of switch statement with example. (06 Marks)
- b. Write a program that takes three coefficients a, b, c if a quadratic equation  $ax^2 + bx + c$  as inputs and computes all possible roots and prints them with appropriate messages. (10 Marks)

OR

- 4 a. What is a loop? Explain the different types of loops in C language with example. (10 Marks)
- b. Explain the syntax of: (i) break (ii) continue (iii) exit (06 Marks)

### Module-3

- 5 a. What is an array? Explain declaration and initialization of array with example. (06 Marks)
- b. Write a program that reads N integer numbers and arranges them in ascending order using bubble sort. (10 Marks)

OR

- 6 a. What is a function? Write a function program to find product of two numbers. (06 Marks)
- b. Explain the two different techniques of passing parameters to a function with example programs. (10 Marks)

### Module-4

- 7 a. What is structure data type? Explain. (04 Marks)
- b. Differentiate structures and unions. (06 Marks)
- c. Explain the concept of array of structure with a program. (06 Marks)

OR

- 8 a. Explain: (i) fopen( ) (ii) fclose( ) (iii) fgets( ) (iv) fputs( ) (08 Marks)
- b. Explain the advantages of structures. (04 Marks)
- c. What is a file? What are the advantages of using files? (04 Marks)

### Module-5

- 9 a. What is a pointer? Write a C program to add two numbers using pointers. (08 Marks)
- b. What is a preprocessor directive? Explain #define and #include –preprocessor directives. (08 Marks)

OR

- 10 a. What is dynamics memory allocation? Explain malloc and calloc function of dynamic memory allocation. (06 Marks)
- b. Write notes on: (i) stacks (ii) queues (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

# CBCS SCHEME

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15ELN15/25

First/Second Semester B.E. Degree Examination, Jan./Feb.2021

## Basic Electronics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- Draw and explain the V-I characteristics of a pn-junction diode. (06 Marks)
  - Draw the circuit of Bridge rectifier and explain its operation. Draw input and output waveforms. (06 Marks)
  - A transistor has  $I_B = 100 \mu\text{A}$  and  $I_C = 2 \text{ mA}$  find (i)  $\beta$  of the transistor (ii)  $\alpha$  of the transistor (iii) Emitter current  $I_E$  (iv) If  $I_B$  changes by  $+25 \mu\text{A}$  and  $I_C$  changes by  $+0.6 \text{ mA}$  find the new values of  $\beta$ . (04 Marks)

OR

- With circuit diagram, explain the operation of Half wave rectifier with capacitor filter and draw the wave forms. (06 Marks)
  - A voltage regulator data sheet includes a load regulation of the regulator as 3 mV while its maximum load voltage is 15 V. Calculate its percentage load regulation. (04 Marks)
  - Explain the principle operation of npn-transistor. (06 Marks)

### Module-2

- For the circuit diagram, shown in Fig. Q3 (a), a silicon transistor with  $\beta = 50$  is used. Draw the d.c. loadline and determine the operating point. (06 Marks)

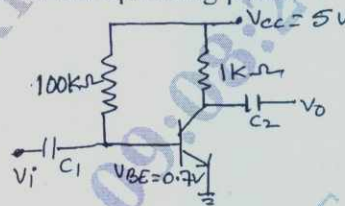


Fig. Q3 (a)

- List the various ideal op-amp characteristics. (04 Marks)
  - Draw an inverting summer amplifier circuit and obtain an expression for the output voltage. (06 Marks)

OR

- Define biasing of a transistor. Draw and explain the base bias transistor circuit. (06 Marks)
  - Draw the internal block diagram of op-amp and explain individual blocks. (06 Marks)
  - A sinusoidal signal with peak value of 6 mV and 2 kHz frequency is applied to the input of an ideal op-amp integrator with  $R_1 = 100 \text{ K}\Omega$  and  $C = 1 \mu\text{F}$ . Find the output voltage. (04 Marks)

### Module-3

- Convert  $(725.25)_8$  to its decimal and binary equivalent.
    - Convert  $[101010111100]_2 = (?)_8 = (?)_{16}$  (04 Marks)
  - Perform  $(15)_{10} - (28)_{10}$  using  $1^s$  and  $2^s$  complement representation. (04 Marks)
  - Simplify the following Boolean function,
    - $AB + \overline{AC} + A\overline{B}C(AB + C)$
    - $\overline{A\overline{B} + ABC} + A(B + \overline{A\overline{B}})$  (04 Marks)
  - Draw the logic diagram and truth table of Half adder using NAND gate. (04 Marks)



OR

- 6 a. Convert : (i)  $(284.65)_{10} = (?)_8 = (?)_{16}$  (ii) Perform  $(28)_{10} - (19)_{10}$  using 2's complement representation. (04 Marks)
- b. State and prove De-Morgan's theorems. (04 Marks)
- c. Implement full adder using two half adders and one OR gate. Write the equations for sum and carry along with truth table. (08 Marks)

**Module-4**

- 7 a. Explain the working of NOR gate, latch with relevant circuit and truth table. (06 Marks)
- b. Explain the architecture of 8051 microcontroller. (10 Marks)

OR

- 8 a. List the difference between latches and flip-flops. (04 Marks)
- b. Explain the working of clocked RS Flip-Flop with suitable logic diagram and truth table, using NAND gate. (04 Marks)
- c. With a neat diagram, explain the operation of microcontroller based stepper motor control system. (08 Marks)

**Module-5**

- 9 a. What is amplitude modulation? Derive the expression for AM wave and draw the waveforms. (08 Marks)
- b. Explain the construction and principle operation of LVDT. (08 Marks)

OR

- 10 a. Give the comparison between FM and AM. (04 Marks)
- b. FM signal is given by,  
 $V(t) = 10 \sin(8 \times 10^9 t + 4 \sin 1500 t)$   
 Find (i) Carrier frequency (ii) Modulation frequency  
 (iii) Frequency deviation and (iv) Modulation index. (04 Marks)
- c. Define transducer. Compare active and passive transducers. (04 Marks)
- d. What is thermistor? Briefly explain the working of thermistor. (04 Marks)

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# CBCS SCHEME

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15ELE15/25

## First/Second Semester B.E. Degree Examination, Jan./Feb. 2021 Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 80

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define and explain Kirchoff's laws with diagram. (05 Marks)  
 b. For the circuit shown in Fig.Q1(b), find the value of R with 20V of supply.

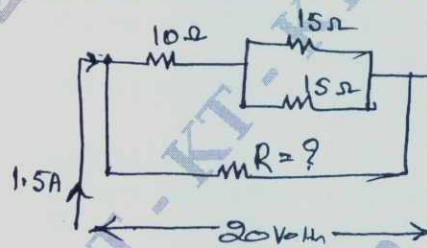


Fig.Q1(b)

- c. Define dynamically induced emf and derive its equation. (06 Marks)

OR

- 2 a. State ohm's law and mention its limitation. (04 Marks)  
 b. An air cored solenoid of 500 turns has a mean length of 50cm and a diameter of 2cm. Determine energy stored in inductor, if the current rises from 0 to 10 Amps in 50m sec. (06 Marks)  
 c. Find the current in all the branches of circuit shown in Fig.Q2(c).

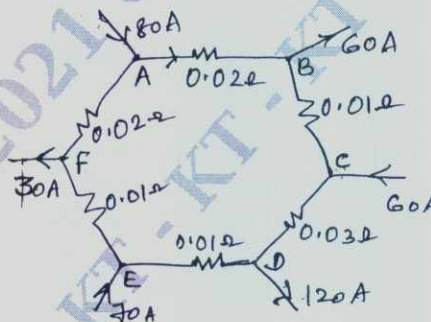


Fig.Q2(c)

(06 Marks)

### Module-2

- 3 a. Explain with the help of neat diagram, principle of operation of DC machine. (05 Marks)  
 b. Explain with help of neat diagram, the constructional features and operation of an induction type single phase energy meter. (06 Marks)  
 c. A 4 pole DC motor has lap connected armature winding, the flux per pole is 30mWb. The number of armature conductor is 250. When connected 230V DC supply it draws an armature current of 40A. Calculate the back emf and the speed with which motor is running. Assume armature resistance is 0.6Ω. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8=50, will be treated as malpractice.

OR

- 4 a. Derive the emf equation of a DC generator. (06 Marks)  
 b. Explain the necessity of starters for DC motor. (05 Marks)  
 c. Explain the dynamometer type wattmeter along with a neat sketch. (05 Marks)

**Module-3**

- 5 a. Develop an expression for RMS and average value of an alternating quantity. (06 Marks)  
 b. A 50Hz, 230V is applied to a  $100\Omega$  resistor write the time equations for voltage, current and find the power consumed by the resistor. (05 Marks)  
 c. Explain any one type of earthing with neat figure. (05 Marks)

OR

- 6 a. Define real power, reactive power and apparent power in an AC supply. (04 Marks)  
 b. Show that the power consumed in a pure inductance is zero. Draw the neat waveform for voltage, current and power. (06 Marks)  
 c. Explain two way control of lamps with trunk table and connection diagram. (06 Marks)

**Module-4**

- 7 a. Mention the advantages of three phase system over single phase system. (05 Marks)  
 b. An armature of three phase alternators has 120 slots. The alternators has 8 poles. Calculate its distribution factor. (05 Marks)  
 c. Show that 2 wattmeters are sufficient to measure power in 3 phase 3 wire system. (06 Marks)

OR

- 8 a. Derive an emf equation of a 3 phase synchronous generator. (05 Marks)  
 b. A 6 pole, 3-phase star connected alternators has 90 slots and 8 conductors per slot and rotates at 1000rpm the flux per pole is 50mWb. Find the induced emf across the lines, by considering the winding factor of 0.97. (05 Marks)  
 c. With the aid of phasor diagram obtain the relationship between the line and phase values of voltages in a 3 phase star connected system. (06 Marks)

**Module-5**

- 9 a. What are the losses in a transformer and how they vary with load? Deduce a condition for maximum efficiency? (06 Marks)  
 b. A single phase transformer has 400 primary turns and 1000 secondary turns 2ac net cross sectional area of the core is  $60\text{cm}^2$ , the supply is 500V at 50Hz. Calculate : i) peak value of flux density ii) the voltage induced in the secondary iii) the number of secondary turns to induced a voltage of 2500V. (06 Marks)  
 c. Explain in brief the concept of rotating magnetic field. (04 Marks)

OR

- 10 a. Compare the ship ring and squirrel cage rotor of an induction motor. (06 Marks)  
 b. A single phase transformer working at unity power factor has an efficiency of 90% at both one half load and at full load of 500W. Determine the efficiency at three fourth full load unity power factors. (05 Marks)  
 c. With a neat diagram, explain the working principle of 3 phase induction motor. (05 Marks)

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# CBCS SCHEME

15CIV18/28

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Question Paper Version : A

First/Second Semester B.E. Degree Examination, Jan./Feb.2021

## Environmental Studies

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 40

### INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fourty questions, each question carries **ONE** mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. Which of the following conceptual spheres of the environment is having the least storate capacity of matter?  
a) Atmosphere      b) Lithosphere      c) Hydrosphere      d) Biosphere
  2. Atmosphere consists of 79 percent Nitrogen and 21 percent Oxygen by  
a) Volume      b) Weight      c) Density      d) All of these
  3. In Complex ecosystem the degree of Species diversity is  
a) Poor      b) High      c) Medium      d) None of these
  4. Access to food is mainly determined by  
a) Household Income      b) Food assistance programmes  
c) Human Resources      d) Society / Community
  5. Which of the following is not the environmental effect of Industrialization, in general?  
a) Solid waste      b) Water pollution  
c) Air pollution      d) Economic growth
  6. 'Earth Day' is held every year on  
a) April 12<sup>th</sup>      b) April 22<sup>nd</sup>      c) April 1<sup>st</sup>      d) June 5<sup>th</sup>





21. Freons are  
 a) HFC                                  b) CFC                                  c) NFC                                  d) Hydrocarbons
22. Each Chlorine Free radicals can destroy the following number of Ozone molecules  
 a) 1000                                  b) 10,000                                  c) 1,00,000                                  d) 100
23. Normal average thickness of stratospheric Ozone layer across the globe is around  
 a) 200DU                                  b) 300DU                                  c) 400DU                                  d) 500DU
24. Petroleum based vehicles emit traces of  
 a) CO and NOx                                  b) SPM                                  c) Aldehyde                                  d) CH<sub>4</sub>.
25. The International Protocol to protect the Ozone layer is  
 a) Vienna Protocol                                  b) Kyoto Protocol  
 c) Cartagena Protocol                                  d) Montreal Protocol.
26. Demography is the study of  
 a) Animals behaviour                                  b) Population growth  
 c) River                                  d) None of these
27. The average life expectancy around the World is currently  
 a) Decreasing                                  b) Increasing                                  c) Not changing                                  d) Stabilizing.
28. Which of the following is not the effect of Urbanization  
 a) Air pollution                                  b) Thermal pollution  
 c) Solid waste protection                                  d) Noise pollution.
29. Noise pollution limits in Industrial area  
 a) 45 dB                                  b) 80dB                                  c) 65 dB                                  d) 90 dB
30. Air pollution from automobiles can be controlled by fitting  
 a) Eletrostatic precipitator                                  b) Wet scrubber  
 c) Catalytic converter                                  d) All of the abover
31. Which of the following source is surface water?  
 a) Springs                                  b) Streams                                  c) Deep wells                                  d) All of these
32. The liquid waste from baths and kitchens is called  
 a) Sullage                                  b) Domestic sewage                                  c) Storm waste                                  d) Run off
33. Molasses from Sugar Industry is used to generate  
 a) Biodiesel                                  b) Hydrogen                                  c) Bioethanol                                  d) Biomethanol
34. Which of the following is used as moderator in the nuclear reactor?  
 a) Graphite                                  b) Helium gas                                  c) Heavy water                                  d) All of these
35. Wind Forms are located in  
 a) River Basin                                  b) Plain area                                  c) Hilly area                                  d) Valley area

36. Solar energy stored in  
a) Carbon – Carbon Bonds                      b) Green leaves  
c) Fossil Fuels                                      d) Biomass.
37. Chernobyl Nuclear disaster occurred in the year  
a) 1984                                      b) 1952                                      c) 1986                                      d) 1987
38. Required Iron content in drinking water as specified by BIS is  
a) 300 mg/ℓ                                      b) 30 mg/ ℓ                                      c) 3 mg/ ℓ                                      d) 0.3 mg/ ℓ
39. Which of the following is not a part of the hydrological cycle?  
a) Precipitation                                      b) Infiltration                                      c) Transpiration                                      d) Perspiration
40. First International Earth Summit was held at  
a) USA    b) Russia  
c) Rio – de - Janerio                                      d) Johannesburg.

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# CBCS SCHEME

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15CPH18/28

**First/Second Semester B.E. Degree Examination, Jan./Feb.2021**  
**Constitution of India, Professional Ethics and Human Rights**

**(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 40

## INSTRUCTIONS TO THE CANDIDATES

1. Answer all the forty questions, each question carries **ONE** mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

- 
1. The first meeting of Constituent Assembly was held in  
a) 1950                      b) 1946                      c) 1947                      d) 1949
  2. Who was The Chairman of the Drafting Committee?  
a) Pandit Nehru              b) K.M. Munshi              c) Dr. Ambedkar              d) L.B. Shastri
  3. The Indian Constitution is  
a) Written                      b) Unwritten                      c) Partly written                      d) None of these
  4. How many Fundamental Rights given to citizens by our Constitution?  
a) Eight                      b) Six                      c) Five                      d) None of these
  5. Right to Constitutional Remedies available under  
a) Article No. 32              b) Article No. 19              c) Article No. 16              d) Article No. 15
  6. The state shall not deny equality to any person under  
a) Article No. 14              b) Article No. 15              c) Article No. 20              d) Article No. 38
  7. The preamble helps to understand  
a) Philosophy of Constitution                      b) Fundamental Rights  
c) Fundamental Duties                      d) Meaning of Constitution
  8. Indian Constitution is  
a) Flexible                      b) Rigid  
c) Rigid-cum Flexible                      d) None of these

9. The Financial Emergency declared in India for  
 a) 2 Times                      b) 3 Times                      c) 5 Times                      d) Never
10. The Indian Constitution came in to force on  
 a) 15<sup>th</sup> Aug-1947                      b) 26<sup>th</sup> Dec-1949                      c) 26<sup>th</sup> Jan-1950                      d) 8<sup>th</sup> Nov-1948
11. How many Fundamental Freedoms guaranteed under our Constitution?  
 a) Six                      b) Ten                      c) Eight                      d) Four
12. The words "Socialist and Secular" incorporated in Constitution under  
 a) 42<sup>nd</sup> Amendment                      b) 86<sup>th</sup> Amendment                      c) 44<sup>th</sup> Amendment                      d) None of these
13. Indian Constitution supports  
 a) Rule of Law                      b) Rule of Women                      c) Rule of Individuals                      d) Rule of Men
14. How many Fundamental duties are there in Indian Constitution?  
 a) Eleven                      b) Five                      c) Six                      d) Eight
15. The practice of untouchability is  
 a) Abolished                      b) Allowed                      c) Granted                      d) None of these
16. Uniform civil code means  
 a) Common Civil code                      b) Common Civil Law applicable to all  
 c) Civil law applicable to women                      d) None of these
17. Minimum age for casting votes  
 a) 18 years                      b) 19 years                      c) 20 years                      d) 21 years
18. Article No. 14 Guarantees equality before law to  
 a) All Persons                      b) Indian Citizens                      c) Women only                      d) Foreigners
19. Employment of children prohibited under the age of  
 a) 14 years                      b) 19 years                      c) 18 years                      d) 16 years
20. The practice of Devadasi prohibited under  
 a) Article No. 23                      b) Article No. 18                      c) Article No. 16                      d) None of these
21. How many types of writs are there?  
 a) 5                      b) 6                      c) 8                      d) 10
22. Writ can be directly filed in  
 a) Supreme Court                      b) District Court                      c) JMFC Court                      d) None of these
23. To be eligible for Election as President a candidate must be  
 a) 35 years of age                      b) 50 years of age                      c) 70 years of age                      d) Any age
24. Minimum age for appointment as Prime Minister in India is  
 a) 25 years                      b) 21 years                      c) 30 years                      d) 35 years
25. The Governor of state responsible to  
 a) President                      b) Prime Minister                      c) Chief Minister                      d) Vice-President



26. The "Power of Pardon" given to President of India under  
 a) Article No. 72      b) Article No. 17      c) Article No. 20      d) Article No. 15
27. Only the Governor of State Empowered to declare emergency in  
 a) Karnataka      b) Tamil Nadu      c) Jammu and Kashmir      d) Andhra
28. The Retirement age of Election Commissioner  
 a) 65 years      b) 70 years      c) 58 years      d) 75 years
29. Distribution of portfolio is power of  
 a) President      b) Prime Minister      c) Vice-President      d) Speaker
30. The chiefs of Army, Navy, Air-force appointed by  
 a) President      b) Prime Minister      c) Chief Minister      d) None of these
31. Human Rights are applicable to  
 a) Women      b) Minorities  
 c) Physically Handicapped      d) All people
32. Human Rights are  
 a) Universal      b) Subjective  
 c) Incontrovertible or unquestionable      d) All of these
33. Responsibility of Engineers means  
 a) Obligation      b) Accountable      c) Conscientious      d) All of these
34. Which of the House cannot be dissolved  
 a) Lok Sabha      b) Rajya Sabha      c) Vidhana Sabha      d) Lower house
35. Discrimination of any kind is  
 a) Prohibited      b) Allowed      c) Granted      d) None of these
36. Supreme can issue  
 a) Writ      b) Decree      c) Ordinance      d) Notification
37. We Indians adopted Constitution on  
 a) 26<sup>th</sup> Nov-1949      b) 26<sup>th</sup> Jan-1950      c) 15<sup>th</sup> Aug-1947      d) 29<sup>th</sup> Aug-1948
38. India is  
 a) A Secular State      b) A Communal State      c) Dictator State      d) None of these
39. Directive Principles enforceable through  
 a) Supreme Court      b) District Court      c) High Court      d) In No Courts
40. President declares Emergency  
 a) On the advice of Council Ministers      b) On the advice of Vice-President  
 c) On his own      d) None of these

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# CBCS SCHEME

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15MAT21

## Second Semester B.E. Degree Examination, Jan./Feb.2021 Engineering Mathematics – II

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Solve by inverse differential operator method,  
$$\frac{d^3y}{dx^3} - 4\frac{dy}{dx} = 3e^{2x} + 10. \quad (05 \text{ Marks})$$
- b. Solve by Inverse differential operator method,  
$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \sin x. \quad (05 \text{ Marks})$$
- c. Solve by variation of parameters method  $\frac{d^2y}{dx^2} + y = \tan x. \quad (06 \text{ Marks})$

OR

- 2 a. Solve  $(D^3 + 1)y = \cos x. \quad (05 \text{ Marks})$
- b. Solve  $(D^2 - 2D)y = x^2 + 2x + 1. \quad (05 \text{ Marks})$
- c. Solve by undetermined coefficients method  $(D^2 + 3D + 2)y = 2e^{-x} + x^2. \quad (06 \text{ Marks})$

### Module-2

- 3 a. Solve  $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \log x. \quad (05 \text{ Marks})$
- b. Solve  $xy \left(\frac{dy}{dx}\right)^2 - (x^2 + y^2) \frac{dy}{dx} + xy = 0. \quad (05 \text{ Marks})$
- c. Solve  $y = 2px + \tan^{-1}(xp^2). \quad (06 \text{ Marks})$

OR

- 4 a. Find the general and singular solution of the equation,  
 $\sin px \cos y = \cos px \sin y + p. \quad (05 \text{ Marks})$
- b. Solve  $p = \tan \left[ x - \frac{p}{1+p^2} \right]. \quad (05 \text{ Marks})$
- c. Solve the Legendre's linear equation,  
 $(1+x)^2 y'' + (1+x)y' + y = 2 \sin[\log(1+x)]. \quad (06 \text{ Marks})$

### Module-3

- 5 a. Form the partial differential equation by eliminating the arbitrary functions from,  
 $z = f(y + 2x) + g(y - 3x). \quad (05 \text{ Marks})$
- b. Solve the partial differential equation,  
$$\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y), \text{ by direct integration.} \quad (05 \text{ Marks})$$
- c. With usual notations derive the one dimensional wave equation as,  $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}. \quad (06 \text{ Marks})$



OR

- 6 a. Form the partial differential equation from  $z = (x + y)f(x^2 - y^2)$ . (05 Marks)
- b. Solve  $\frac{\partial^2 z}{\partial x^2} + 5\frac{\partial z}{\partial x} + 6z = 0$  with  $z = 0$  and  $\frac{\partial z}{\partial x} = e^{-y}$  at  $x = 0$ . (05 Marks)
- c. Solve one dimensional heat equation by variable seperable method as,  $\frac{\partial y}{\partial t} = C^2 \frac{\partial^2 y}{\partial x^2}$ . (06 Marks)

**Module-4**

- 7 a. Change the order of integration and hence evaluate, (05 Marks)
- $$\int_0^a \int_y^a \frac{x}{x^2 + y^2} dx dy.$$
- b. Evaluate  $\int_0^1 \int_{y^2}^{1-x} \int_0^{1-x} x dz dx dy$ . (05 Marks)
- c. Prove that  $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ . (06 Marks)

OR

- 8 a. Evaluate by Changing into polar co-ordinates, (05 Marks)
- $$\int_0^1 \int_0^{\sqrt{1-y^2}} (x^2 + y^2) dx dy.$$
- b. Find the volume of the sphere,  $x^2 + y^2 + z^2 = a^2$  by triple integration. (05 Marks)
- c. Prove that  $\int_0^1 \frac{x^2}{\sqrt{1-x^4}} dx \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$  by using Beta gamma functions. (06 Marks)

**Module-5**

- 9 a. Find the Laplace transform of  $(1 + te^{-t})^3$ . (05 Marks)
- b. Find the Laplace transform of the function,  $f(t) = E \sin \omega t$ ,  $0 < t < \frac{\pi}{\omega}$ , having the period  $\frac{\pi}{\omega}$ . (05 Marks)
- c. Using Laplace transform techniques, solve  $\frac{d^2 x}{dt^2} - 2\frac{dx}{dt} + x = e^t$  with  $x = 2$ ,  $\frac{dx}{dt} = -1$  at  $t = 0$ . (06 Marks)

OR

- 10 a. Find the Laplace transforms of, (05 Marks)
- (i)  $t \cos t$  and (ii)  $\frac{\sin^2 t}{t}$ .
- b. Find  $L^{-1} \left[ \log \sqrt{\frac{s^2 + b^2}{s^2 + a^2}} \right]$ . (05 Marks)
- c. Use convolution theorem to evaluate  $L^{-1} \left[ \frac{1}{(s+a)(s+b)} \right]$ . (06 Marks)

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