CBCS SCHEME

15MAT11

First Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Mathematics – I

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1 a. If $y = e^{-2x} \cos^3 x$, find y_n. **(05 Marks)**

   b. If $y = a\cos(\log x) + b\sin(\log x)$, prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$. **(06 Marks)**

   c. Prove that the curves $r = a(1 + \sin\theta)$ and $r = a(1 - \sin\theta)$ cut orthogonally. **(05 Marks)**

OR

2 a. Find the radius of curvature of the curve $r^n = a^n \cos n\theta$. **(05 Marks)**

   b. Find the pedal equation of $r = 2(1 + \cos\theta)$. **(06 Marks)**

   c. If $y = e^{m\sin^{-1}x}$ prove that $(1-x^2)y_{n+2} - (2x+1)xy_{n+1} - (n^2+m^2)y_n = 0$. **(05 Marks)**

Module-2

3 a. Expand $\log\cos x$ in powers of $\left(x - \dfrac{\pi}{3}\right)$ using Taylor's series. **(05 Marks)**

   b. Evaluate $\lim\limits_{x \to 0}\left(\dfrac{a^x + b^x + c^x}{3}\right)^{1/x}$. **(06 Marks)**

   c. If $\sin u = \dfrac{x^2 y^2}{x + y}$ show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 3\tan u$. **(05 Marks)**

OR

4 a. Using Maclaurin's series, expand $\log(1 + e^x)$ in ascending powers of x. **(05 Marks)**

   b. If $u = f(x, y)$ and $x = r\cos\theta$, $y = r\sin\theta$, prove that $\left(\dfrac{\partial u}{\partial x}\right)^2 + \left(\dfrac{\partial u}{\partial y}\right)^2 = \left(\dfrac{\partial u}{\partial r}\right)^2 + \dfrac{1}{r^2}\left(\dfrac{\partial u}{\partial v}\right)^2$. **(06 Marks)**

   c. If $u = x^2 + y^2 + z^2$, $v = x + y + z$, $w = xy + yz + zx$, evaluate $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$. **(05 Marks)**

Module-3

5 a. A particle moves along the curve $x = 1 - t^3$, $y = 1 + t^2$ and $z = 2t - 5$, determine the components of velocity and acceleration at $t = 1$ in the direction $2i + j + 2k$. **(05 Marks)**

   b. Find the directional derivatives of $\phi = x^2 yz + 4xz^2$ at the point $(1, -2, -1)$ along the direction of $2i - j - 2k$. **(06 Marks)**

   c. Prove that $\operatorname{div}(\operatorname{curl}\vec{F}) = 0$. **(05 Marks)**

OR

6 a. If $\vec{F} = (3x^2 3yz)\hat{i} + (3y^2 - 3zx)\hat{j} + (3z^2 - 3xy)\hat{k}$, find (i) div F   (ii) curl F.   **(05 Marks)**

   b. If $F = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$ is irrotational, find a, b, c.   **(06 Marks)**

   c. Prove that $curl(\phi A) = \phi(curl\,A) + \nabla\phi \times A$ **(05 Marks)**

Module-4

7 a. Find the reduction formula for $\int \sin^n x\,dx$ **(05 Marks)**

   b. Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2 x$ **(06 Marks)**

   c. Evaluate $\displaystyle\int_0^1 \dfrac{x^9}{\sqrt{1-x^2}}\,dx$.   **(05 Marks)**

OR

8 a. Find the orthogonal trajectory of the curve $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2+\lambda} = 1$, where λ is the parameter.   **(05 Marks)**

   b. Solve $(1+e^{x/y})dx + e^{x/y}\left(1 - \dfrac{x}{y}\right)dy = 0$.   **(06 Marks)**

   c. A body in air at 25°C cools from 100°C to 75° in one minute. Find the temperature of the body at the end of three minutes.   **(05 Marks)**

Module-5

9 a. Find the Rank of the matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$.   **(05 Marks)**

   b. Apply Gauss-elimination method, to solve the system of equations $x + y + z = 9$, $x - 2y + 3z = 8$, $2x + y - z = 3$.   **(06 Marks)**

   c. Reduce the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ to diagonal form.   **(05 Marks)**

OR

10 a. Find the largest Eigen value and the corresponding Eigen vector of $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ and $X = (1\ 0\ 0)^1$ as initial vectors.   **(05 Marks)**

   b. Solve the system of equations $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$. Carry out the 4th iterations, using Gauss-Seidal method.   **(06 Marks)**

   c. Reduce the quadratic form of $x^2 + 5y^2 + z^2 + 2xy + 6xz + 2yz$ into canonical form.   **(05 Marks)**

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CBCS SCHEME

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First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Chemistry

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a. Derive Nernst equation for single electrode potential.   **(05 Marks)**
    b. What are ion selective electrodes? Explain the determination of P^H using glass electrode.
                                                                                              (05 Marks)
    c. What are fuel cells? Describe the construction and working of $CH_3OH - O_2$ fuel cell.
                                                                                              (06 Marks)

OR

2   a. Calculate EMF of a concentration cell constructed by immersing two silver electrodes in siver nitrate solutions of concentration 0.1M and 100M at 298K. Write cell representation.
                                                                                              (05 Marks)
    b. Describe the construction and working of Zinc – Air battery.   **(05 Marks)**
    c. Explain the following battery characteristics :
       i) Cell potential/EMF   ii) Capacity   iii) Cycle life.   **(06 Marks)**

Module-2

3   a. Explain electrochemical theory of corrosion of iron.   **(05 Marks)**
    b. Discuss the effect of i) relative areas of anode and cathode ii) nature of corrosion product on the rate of corrosion.   **(05 Marks)**
    c. What is electroless plating? Mention any four differences between electroplating and electro-less plating.   **(06 Marks)**

OR

4   a. Describe differential aeration corrosion with an example.   **(05 Marks)**
    b. What is Galvanization? Describe the process of Galvanization of iron sheet.   **(05 Marks)**
    c. Explain the effect of the following on the nature of electro-deposit :
       i) Current density   ii) P^H iii) Temperature of electro plating bath.   **(06 Marks)**

Module-3

5   a. On combustion, 0.80 g of solid fuel in a Bomb calorimeter, increased the temperature of 3.1 kg of water by 2.3°C. The water equivalent of copper calorimeter and latent heat of steam are 0.47kg and 2457kJ/kg respectively. If the fuel contains 2.5% Hydrogen, calculate the gross and net calorific value of the fuel. Given specific heat of water of 4.187kJ/kg°C.
                                                                                              (05 Marks)
    b. Explain the synthesis of petrol by Fischer – Tropsch's process.   **(05 Marks)**
    c. Describe the preparation of solar grade silicon by union carbide process.   **(06 Marks)**

OR

6 a. Explain how calorific value of a solid fuel determined using bomb calorimeter. **(05 Marks)**
   b. What is meant by reformation of petrol? Explain any four reforming reactions. **(05 Marks)**
   c. Describe the construction and working of a photovoltaic cell. Mention the advantages.
   (06 Marks)

Module-4

7 a. Define glass transition temperature. Discuss any two paramters influencing T_g of a polymer.
   (05 Marks)
   b. Discuss the synthesis and applications of exposy resins. **(05 Marks)**
   c. What are conducting polymers? Describe the mechanisms of conduction in polyaniline.
   (06 Marks)

OR

8 a. Illustrate free radical mechanism of addition polymerization taking vinyl choride as monomer. **(05 Marks)**
   b. Discuss the following structure – property relationships i) Tensile strength ii) Crystallinity.
   (05 Marks)
   c. Explain the preparation of : i) polymethyl – methalacrylate (PMMA) ii) Kevlar. **(06 Marks)**

Module-5

9 a. What is boiler corrosion? Discuss the boiler corrosion due to dissolved oxygen and $MgCl_2$.
   (05 Marks)
   b. Define COD and BOD. Mention any three differences. **(05 Marks)**
   c. What are nano-materials? Discuss the synthesis of nano-materials by sol-gel method.
   (06 Marks)

OR

10 a. Discuss secondary treatment of sewage using activated sludge method. **(05 Marks)**
   b. What is meant by desalination of water? Explain desalination by reverse osmosis method.
   (05 Marks)
   c. Write a note on carbon nano tubes and fullerenes. **(06 Marks)**

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CBCS SCHEME

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Physics

Time: 3 hrs.

Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
    2. *Physical Constants:*   *Velocity of light,* $C = 3 \times 10^8$ *m/S,*
                      Plank's constant $h = 6.625 \times 10^{-34}$ *JS;*
                      Mass of electron $m_e = 9.11 \times 10^{-31}$ *kg,*
                      Boltzmann constant $K = 1.38 \times 10^{-23}$ *J/K,*
                      Avagadro number, $N_A = 6.02 \times 10^{26}$ */Kmole,*
                      Charge of electron $e = 1.6 \times 10^{-19}$ *C*

Module-1

1   a.   Explain briefly the Planck's radiation law and reduce it to Wien's law and Rayleigh-Jeans law.   **(06 Marks)**
    b.   Using time – independent Schrodinger's wave equation for a particle in one dimensional potential well of infinite height, obtain an expression for normalization of wave function.   **(06 Marks)**
    c.   An electron is bound in one dimensional well of width $0.5A^0$ but of infinite height. Find the energy value in eV for the ground state and first two excited state.   **(04 Marks)**

OR

2   a.   What is Phase velocity and group velocity? Obtain the relation between phase velocity and group velocity.   **(06 Marks)**
    b.   What is Wave function 'Ψ'? Give its properties and physical significance.   **(06 Marks)**
    c.   Calculate the de - Broglie wavelength associated with an electron whose kinetic energy is 150 eV.   **(04 Marks)**

Module-2

3   a.   Derive an expression for electrical conductivity based on quantum free electron theory.   **(06 Marks)**
    b.   What is Meissner effect? Distinguish between type I and type II superconductor.   **(06 Marks)**
    c.   Calculate the Fermi velocity and mean free path for the conduction electrons in silver , given that its Fermi energy is 5.5eV, and the relaxation time for electrons is 3.83×10^{-14}s.   **(04 Marks)**

OR

4   a.   What is Superconductivity? Explain BCS theory of super conductivity.   **(06 Marks)**
    b.   Explain how quantum free electron theory succeeded in overcoming the drawbacks of classical free electron theory.   **(06 Marks)**
    c.   Calculate the drift velocity of the electron in the presence of an applied elective field of strength 50V/m, whose mobility in a conductor is 5×10^{-3} m^2 V^{-1} S^{-1}.   **(04 Marks)**

Module-3

5   a.   Explain the construction and working of CO_2 laser with the help of energy level diagram.   **(08 Marks)**

b. Obtain an expression for Numerical aperture in an optical fibre. **(04 Marks)**

c. The angle of acceptance of an optical fibre is 38^0 when kept in air. Find the angle of acceptance when it is in a medium of Refractive index 1.33. **(04 Marks)**

OR

6 a. Derive an expression for energy density of radiation in terms Einstein's A and B coefficients. **(06 Marks)**

b. Explain three types of optical fibres with a neat diagram. **(06 Marks)**

c. Find the ratio of population of two energy levels of the wavelength of light emitted at 340K is 6340 A^0. **(04 Marks)**

Module-4

7 a. Define Unit cell. Describe briefly the seven crystal systems with neat diagram. **(08 Marks)**

b. Derive Bragg's law for X – ray diffractions by crystals. **(04 Marks)**

c. Draw the following planes in a cubic unit cell :
(100) , (110) (112) and (121). **(04 Marks)**

OR

8 a. Define Packing factor. Calculate the packing factor for sc, bcc and fcc structures. **(07 Marks)**

b. Describe the crystal structure of Diamond. **(05 Marks)**

c. The interplanar spacing in a crystal is $1A^0$ and the glancing angle is 30^0. Calculate the wavelength of the X – rays for first order Bragg reflection. **(04 Marks)**

Module-5

9 a. Define Mach Number. Distinguish between ultrasonics and supersonic waves. **(04 Marks)**

b. What is carbon nanotube. Write down any four properties and four applications of carbon nanotube. **(06 Marks)**

c. Explain the Sol – Gel and ball milling methods of synthesis of nano materials. **(06 Marks)**

OR

10 a. What is Shock wave? Write down the applications of shock wave. **(04 Marks)**

b. Describe the construction and working of Reddy's shock tube. **(06 Marks)**

c. Explain with principle , working of Scanning Electron microscope. **(06 Marks)**

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15PCD13/23

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. What is Pseudocode and its use? Write a Pseudocode for adding four (4) numbers. **(04 Marks)**
  b. Explain the structure of a 'C' program with an example syntax. **(08 Marks)**
  c. Write a 'C' program to SWAP the values of two (2) variables without using third variable. **(04 Marks)**

OR

2 a. What is an identifier? Give any five rules that are the be followed, while declaring a variable. Give example for valid and invalid. **(05 Marks)**
  b. What is an operator? Explain different types of operators in 'C'. **(07 Marks)**
  c. If a = 2, b = 8, c = 4, d = 10, what is the value of each of the following expression.
     i) $a + b/c * d - c/a$ ii) $(b/a)\% c$ iii) $a +++b--+ d++$ iv) $++ a + b-- + ++d$. **(04 Marks)**

Module-2

3 a. Explain switch statement with syntax. Write a program to simulate simple calculator that performs arithmetic operations using switch statement. **(08 Marks)**
  b. List four differences between while loop and do-while loop along with, syntax and example. **(08 Marks)**

OR

4 a. What are the different types of conditional decision making statements? Explain each with an example. **(09 Marks)**
  b. Write a C program to find the roots of a quadratic equation (check for valid input values) **(07 Marks)**

Module-3

5 a. What is an array? How an array is declared and initialize, explain. **(06 Marks)**
  b. Explain any four string manipulation functions along with example each. **(04 Marks)**
  c. Develop 'C' function ISPRIME (num) that accepts an integer argument and return 1 if argument is prime, a θ otherwise. Write a C program that invokes this function to generate prime no's between the given ranges. **(06 Marks)**

OR

6 a. What is a function? Briefly explain parameters passing mechanism of functions. **(05 Marks)**
  b. Write a C program to read a sentence and print the frequencies of each VOWEL total count of CONSONENTS. **(06 Marks)**
  c. Write a recursion program to compute factorial of a given number 'n'. **(05 Marks)**

Module-4

7 a. What is structure? Explain declaration of structure with an example. **(05 Marks)**

b. Write a program to input the following detail of 'N' students using structures
RollNo, Name, Marks, Grade
Print the names of the students with marks ≥ 70. **(07 Marks)**

c. What is a file, explain fopen( ) and fclose( ) functions. **(04 Marks)**

OR

8 a. Explain the following file operations along with syntax and example.
i) fopen( ) ii) fscan( ) iii) fprinf ( ) iv) fgets( ). **(08 Marks)**

b. Given 2 university information file studentname.txt and usn.txt that contains students name and USN respectively. Write a program to create a new file called "output.txt" and copy the contents of file "studentname.txt and usn.txt into output file in the sequence shown below:

Student Name	USN
Name – 1	USN – 1
Name – 2	USN – 2
.	.
.	.
.	.
.	.

(08 Marks)

Module-5

9 a. Define pointer? Explain with an example, the declaration and initialization of pointer variable. **(04 Marks)**

b. Explain the following 'C' functions
i) malloc( ) ii) calloc( ) iii) realloc( ) **(06 Marks)**

c. Write a C program to read two numbers and develop a function to swap these numbers using pointers. **(06 Marks)**

OR

10 a. Explain any five preprocessor directives in C. **(05 Marks)**

b. What are primitive and non-primitive data types. **(04 Marks)**

c. What is stack? Explain stack operations with examples program. **(07 Marks)**

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CBCS SCHEME

15ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. State Ohm's law and mention its limitations.   (04 Marks)
     b. Derive an expression for energy stored in a magnetic field.   (06 Marks)
     c. A circuit of two parallel resistors having resistance of 20Ω and 30Ω respectively connected in series with 15Ω resistor. If the power dissipation in 15Ω resistor is 135 watts, find:
         i)   Current in 20Ω and 30Ω resistors
         ii)   Voltage across whole circuit and
         iii) Power consumed in 20Ω resistor.   (06 Marks)

OR

2   a. State and explain Kirchoff's laws.   (04 Marks)
     b. A coil consists of 600 turns and a current of 10A in the coil gives rise to a magnetic flux of 1m wb. Calculate: i) Self inductance   ii) Induced emf   iii) Energy stored when the current is reversed in 0.01 second.   (06 Marks)
     c. A coil of 1000 turns is wound on a silicon steel ring of relative permeability 1200. The ring has mean diameter of 10cms and cross-sectional area of $12cm^2$. When a current of 4 ampere flows through the coil, find:
         i)   Flux in the coil
         ii)   Inductance of the coil
         iii) The emf induced in the coil if the flux falls to zero in 15 milliseconds
         iv)   Now if another similar coil is placed such that 70% magnetic coupling exists between the coils, find the mutual inductance.   (06 Marks)

Module-2

3   a. Explain the working principle of D.C. generator.   (04 Marks)
     b. Explain working principle of dynamometer type of wattmeter.   (06 Marks)
     c. The field resistance and armature resistance of a 500V, 4 pole wave connected of a 500V, 4 pole wave connected dc shunt motor are 250 ohm and 0.1 ohm respectively. The armature has 492 conductors and flux per pole is 0.05 wb. Calculate the speed and torque when the full load current is 20 amps.   (06 Marks)

OR

4   a. Derive equation for the torque developed in the armature of a D.C. motor.   (04 Marks)
     b. With neat diagram, explain the working principle of inducting type energy meter.   (06 Marks)
     c. A 4 pole 1500 rpm dc generator has cup wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 wb, calculate the e.m.f generated in the armature. What would be the generated emf if the winding is wave connected?   (06 Marks)

Module-3

5 a. Prove that in a purely inductive circuit the current lags voltage by 90°. **(06 Marks)**

b. With the help of circuit diagram, explain the two way control of 1 amp. **(04 Marks)**

c. A 250 volts at 50Hz is applied across R.C. series, circuit. The current of 2.2A flowing through it causes a power loss of 96.8 watts in the resistor, power loss of 96.8 capacitor is negligible. Calculate the resistance and capacitance. Also find the p.f. of the circuit. **(06 Marks)**

OR

6 a. Define average and r.m.s values of an alternating current. **(04 Marks)**

b. Define the following:
   i)   Fusing current
   ii) Rated current of fuse and
   iii) Fusing factor. **(04 Marks)**

c. Two impedances $z_1 = (150 + j157)$ ohm and $z_2 = (100 - j110)$ ohm are connected in parallel across 220V, 50Hz supply. Find the total current, total power drawn and power factor. **(08 Marks)**

Module-4

7 a. Obtain relationship between line and phase values of voltage in a three phase balanced star connected system. **(06 Marks)**

b. Derive the E.m.f equation of an alternator. **(06 Marks)**

c. A 3-phase delta connected load consumes a power of 60kW taking a lagging current of 200A at a line voltage of 400V, 50Hz, find the parameters of each phase. **(04 Marks)**

OR

8 a. Show that in a three phase star connected balanced circuit two wattmeters are sufficient to measure the total power. Also obtain expression for power factor of the circuit. **(08 Marks)**

b. A 3 phase, 16 pole alternator has star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03wb and the speed is 375rpm. Find the frequency, the phase emf and line emf. Assume pitch factor $k_c = 1$ and distribution factor $k_d = 0.96$. Also determine the output KVA of the alternator. If the total current in phase is 40A. **(08 Marks)**

Module-5

9 a. Derive emf equation of a transformer. **(04 Marks)**

b. Derive the relation ship between the frequency of the rotor induced emf and the frequency of the supply given to the stator. **(04 Marks)**

c. A 500KVA, transformer has an efficiency of 92% at full load, unity power factor and at half full load, 0.9 power factor. Determine its efficiency at 80% of full load and 0.95 power factor. **(08 Marks)**

OR

10 a. Explain the various losses in a transformer and how to minimize them. Give equations for these losses. **(06 Marks)**

b. A 250 KVA, 11000/415V, 50Hz single phase transformer has 80 turns on the secondary. Calculate: i) Maximum value of flux   ii) Rated current in primary and secondary. **(04 Marks)**

c. An 8 pole alternator runs at 750 rpm supplies power to 4 pole induction motor. The frequency of rotor is 1.5Hz. What is the speed of the motor? What is the slip? **(06 Marks)**

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CBCS SCHEME

USN

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Basic Electronics

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. What is Rectifier? Explain the operation of full wave rectifier, with neat circuit and
          waveform.   **(06 Marks)**
    b. Explain the operation of npn transistor.   **(04 Marks)**
    c. A half wave rectifier circuit is supplied from secondary transform voltage of 108.423V to a
          resistive load of 10KΩ. The diode forward resistance is 10Ω. Calculate the maximum ,
          average , RMS value of current , DC output voltage , efficiency of transformer.   **(06 Marks)**

OR

2 a. Explain the input and output characteristics of npn transistor in Common Base Mode.
                                                                                 (06 Marks)
    b. Draw the V- I, characteristics of Si and G_e diode.   **(04 Marks)**
    c. Establish the relationship between α and β. Also calculate β, α and I_E of the transistor, when
          I_B = 100μA and I_C = 2mA. Find new value of B when I_B changes by +25 μA and I_C by
          0.6mA.   **(06 Marks)**
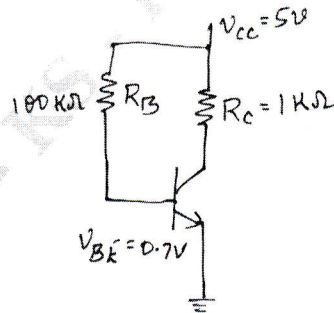
Module-2

3 a. Define the following and derive the expression for its output voltage
          i) Differentiator   ii) Integrator.   **(06 Marks)**
    b. List the ideal characteristics of Op - amp.   **(04 Marks)**
    c. Calculate the minimum and maximum values of I_C and V_{CE} for the voltage divider bias
          circuit when $h_{fc(max)}$ = 60 and $h_{fc(min)}$ = 50. For circuit V_{CC} = 12V , R_1 = 10K , R_2 = 2K ,
          R_E = 470Ω and R_C = 2K. Assume Silicon transistor.   **(06 Marks)**

OR

4 a. For the circuit diagram shown in fig. Q4(a), Si transistor with β = 50 is used. Draw dc load
          line and determine the operating point.   **(08 Marks)**

Fig.Q4(a)

    b. Draw inverting bumming amplifier circuit and obtain an expression for the output voltage.
                                                                                 (06 Marks)
    c. Find the gain and output voltage for a non – inverting amplifier using Op – amp when input
          voltage is i) 0.5V   ii) -3V.   **(02 Marks)**

Module-3

5 a. State and prove De Morgan's Theorem for 3-variables.   (04 Marks)

    b. Realize the following expression using only NAND gates

        $f = (A + \overline{B} + C)\,(\overline{A} + B + C)$.   (04 Marks)

    c. Explain full adder and implement full adder using two half adder and an OR gate.   (08 Marks)

OR

6 a. Perform Binary subtraction using 1's and 2's complement method for the following :

      i)   15 – 13   ii) 28 - 19.   (08 Marks)

    b. Convert the following :   i) $(12.125)_{10} = (?)_2$ ii) $(10AB)_{16} = (?)_2$

      iii) $(101010111100)_2 = (?)_{16}$ iv) $(57.6)_8 = (?)_2$.   (04 Marks)

    c. Realize OR and AND gates using only NAND gates and using only NOR gates.   (04 Marks)

Module-4

7 a. Explain NOR gate latch.   (04 Marks)

    b. With neat block diagram, explain the architecture of micro controller.   (08 Marks)

    c. Explain the working of clocked RS flip flop.   (04 Marks)

OR

8 a. List the difference between Microcontroller and Microprocessor.   (04 Marks)

    b. With neat block diagram, explain the interfacing of stepper motor to 8051 microcontroller.

                                           (08 Marks)

    c. Explain NAND gate latch.   (04 Marks)

Module-5

9 a. Explain the need for modulation.   (04 Marks)

    b. An audio frequency signal $10 \sin 2\pi\, 500t$ is used to amplitude modulate a carrier of $50 \sin 2\pi\, 10^5$. Calculate i) Modulation index   ii) Side band frequencies

      iii) Amplitude of each side band   iv) Bandwidth required

      v) Total power delivered to the load 600Ω vi) Transmission efficiency.   (06 Marks)

    c. Give the comparison between FM and AM.   (06 Marks)

OR

10 a. Explain the working of Envelope detector.   (04 Marks)

    b. Define Modulation index in terms of E_{max} and E_{min}.   (06 Marks)

    c. Write short note on :

      i) Resistive transducer   ii) Peltier effect   iii) Seebeck effect.   (06 Marks)

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<div align="right">15CIV13/23</div>

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Elements of Civil Engineering and Mechanics

Time: 3 hrs.   Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing
ONE full question from each module.
2. Missing data suitably be assumed.

Module-1

1 **a.** Explain briefly the role of civil engineers in the infrastructure development of a country.
(06 Marks)

   b. Draw typical cross section of a road and explain its components. **(06 Marks)**

   c. A 100N vertical force is applied to the end of a lever which is attached to a shaft as shown in Fig.Q.1(c). Determine:
   i) Moment of force about 'O'
   ii) The horizontal force applied at 'A' which creates same moment about 'O'. **(04 Marks)**
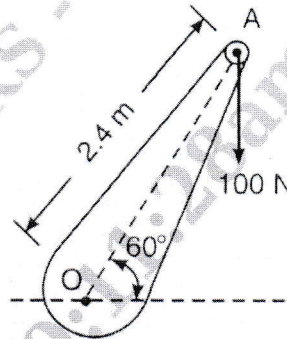

Fig.Q.1(c)

OR

2 **a.** Reduce the system in Fig.Q.2(a) to
   i) Single force
   ii) Single force and couple at A
   iii) Single force and couple at B **(06 Marks)**
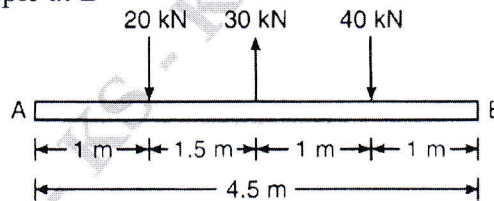

Fig.Q.2(a)

   b. Define couple. Explain its characteristics. **(04 Marks)**
   c. Distinguish between Gainty Dam and Earthen Dam. **(06 Marks)**
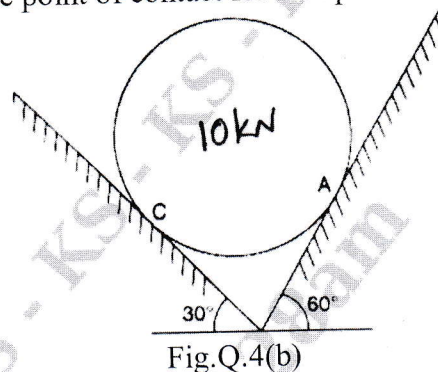
Module-2

3 **a.** State and prove parallelogram law of forces. **(06 Marks)**
   b. State the laws of static friction. **(04 Marks)**

c. Four coplanar forces acting at a point are as shown in Fig.Q.3(c). One of the forces is unknown and its magnitude is as shown by 'F'. The resultant is 500N and is along x-axis. Determine the force 'F' and its inclination θ with x-axis. **(06 Marks)**

Fig.Q.3(c)
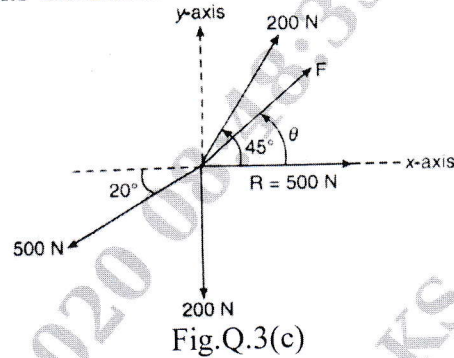
OR

4 a. State and prove Lami's theorem. **(04 Marks)**
   b. Determine the reactions at the point of contact for the sphere shown in Fig.Q.4(b). **(04 Marks)**

Fig.Q.4(b)

c. Determine the force P required to cause motion of blocks to impend. Take the weight of A as 90N and weight of B as 45N. Take the coefficient of friction for all contact surfaces as 0.25. Consider the pulleys as frictionless (Fig.Q.4(c)). **(08 Marks)**
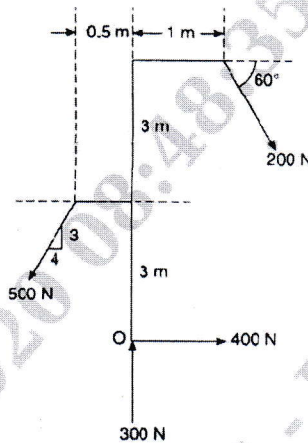

Fig.Q.4(c)
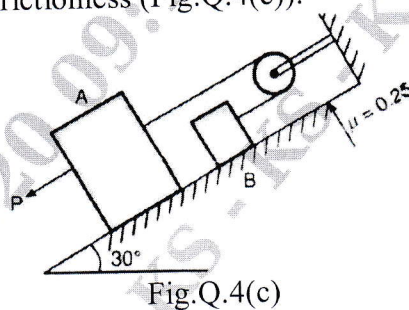
Module-3

5 a. State and prove Varignon's theorem. **(06 Marks)**
   b. Find the reactions for the beam supported and loaded as shown in Fig.Q.5(b). **(10 Marks)**

Fig.Q.5(b)
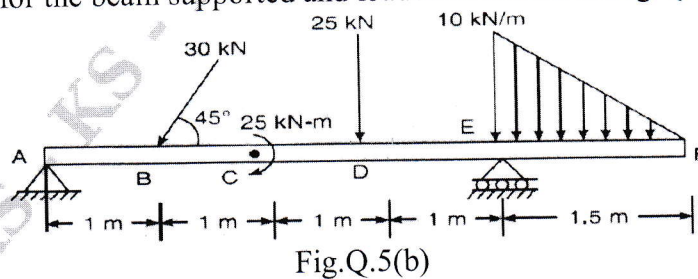
OR

6   a. Explain different type of supports with sketches and reactions.   **(06 Marks)**
    b. Determine the resultant of the four forces acting on a frame as shown in Fig.Q6(b) with respect to point 'O'.   **(10 Marks)**
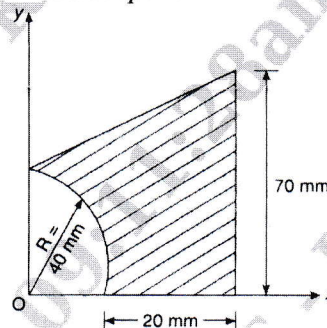
Fig.Q.6(b)

Module-4

7   a. Derive an expression for the centroid of semicircle with respect to base.   **(06 Marks)**
    b. Compute the Radii of gyration about its centroidal axes Fig.Q.7(b).   **(10 Marks)**

OR

8   a. Derive an expression for the moment of inertia of a quadrant about its centroidal axes.   **(08 Marks)**
    b. Determine the position of centroid with respect to 'O' shown in Fig.Q.8(b).   **(08 Marks)**

Fig.Q.8(b)

Module-5

9   a. What is Pojectile? Define the following term briefly: i) Angle of projection   ii) Horizontal range   iii) Vertical height   and   iv) Time of flight.   **(08 Marks)**
    b. A stone is thrown vertically upward from the top of tower 20m high with a velocity of 15m/s. Find: i) The highest elevation reached by the store   ii) The time required for the stone to cross the top of tower during its downward motion and corresponding velocity.   **(08 Marks)**

OR

10 a. What is super elevation? What is its purpose?   **(04 Marks)**
    b. The particle moves along a curve of characteristic $x = 0.65y^2$. Its value of motion is $x = 4r^2$ at the instant when $t = 3s$. Determine: i) The displacement of particle from origin   ii) The velocity of particle   iii) The acceleration of particle.   **(06 Marks)**
    c. The acceleration of a particle is defined by $a = -3m/s^2$ if $V = 9m/s$ and $V = 9m/s$ and $x = 0$ when $t = 0$. Determine: i) Velocity   ii) Distance travelled at $t = 9s$.   **(06 Marks)**

* * * * *

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15MAT21

Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 $\dfrac{dy^2}{dx^2} - 4y = \cosh(2x-1) + 3^x$ by inverse differential operators method. **(06 Marks)**

   b. Solve $(D^3 - 1)y = 3\cos 2x$ by inverse differential operators method. **(05 Marks)**

   c. Solve $(D^2 + a^2)y = \sec(ax)$ by the method of variation of parameters. **(05 Marks)**

OR

2   a. Solve $(D^2 - 2D + 5)y = e^{2x}\sin x$ by inverse differential operator method. **(06 Marks)**

   b. Solve $(D^3 + D^2 + 4D + 4)y = x^2 - 4x - 6$ by inverse differential operator method. **(05 Marks)**

   c. Solve $y'' - 2y' + 3y = x^2 - \cos x$ by the method of undetermined coefficients. **(05 Marks)**

Module-2

3   a. Solve $x^3 y''' + 3x^2 y'' + xy' + 8y = 65\cos(\log x)$ **(06 Marks)**

   b. Solve $xy\left(\dfrac{dy}{dx}\right)^2 - (x^2 + y^2)\dfrac{dy}{dx} + xy = 0$ **(05 Marks)**

   c. Solve the equation $(px - y)(py + x) = 2p$ by reducing into Clairaut's form taking the substitution $X = x^2$, $Y = y^2$. **(05 Marks)**

OR

4   a. Solve $(2x-1)^2 y'' + (2x-1)y' - 2y = 8x^2 - 2x + 3$ **(06 Marks)**

   b. Solve $y = 2px + p^2 y$ by solving for 'x'. **(05 Marks)**

   c. Find the general and singular solution of equation $xp^2 - py + kp + a = 0$. **(05 Marks)**

Module-3

5   a. Obtain partial differential equation by eliminating arbitrary function.

     Given $z = y^2 + 2f\left(\dfrac{1}{x} + \log y\right)$. **(06 Marks)**

   b. Solve $\dfrac{\partial^2 u}{\partial x \partial t} = e^{-t}\cos x$, given that $u = 0$ when $t = 0$ and $\dfrac{\partial u}{\partial t} = 0$ at $x = 0$. **(05 Marks)**

   c. Derive one dimensional wave equation $\dfrac{\partial^2 u}{\partial t^2} = C^2 \dfrac{\partial^2 u}{\partial x^2}$ **(05 Marks)**

OR

6   a. Obtain partial differential equation of
     $f(x^2 + 2yz, y^2 + 2zx) = 0$. **(06 Marks)**

   b. Solve $\dfrac{\partial^2 z}{\partial x^2} = a^2 z$, given that when $x = 0$, $z = 0$ and $\dfrac{\partial z}{\partial x} = a\sin y$. **(05 Marks)**

c. Find the solution of one dimensional heat equation $\dfrac{\partial u}{\partial t} = C^2 \dfrac{\partial^2 u}{\partial x^2}$. **(05 Marks)**

Module-4

7   a. Evaluate $\displaystyle\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \dfrac{dx\,dy\,dx}{(1+x+y+z)^3}$. **(06 Marks)**

    b. Evaluate integral $\displaystyle\int_0^1 \int_x^{\sqrt{x}} xy\,dy\,dx$ by changing the order of integration. **(05 Marks)**

    c. Obtain the relation between Beta and Gamma function in the form $\beta(m,n) = \dfrac{\overline{|m}\ \overline{|n}}{\overline{|m+n}}$ **(05 Marks)**

OR

8   a. Evaluate $\displaystyle\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$ by changing into polar co-ordinates. **(06 Marks)**

    b. If A is the area of rectangular region bounded by the lines x = 0, x = 1, y = 0, y = 2 then evaluate $\displaystyle\int_A (x^2 + y^2)\,dA$. **(05 Marks)**

    c. Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{d\theta}{\sqrt{\sin\theta}} \int_0^{\pi/2} \sqrt{\sin\theta}\,d\theta$ using Beta and Gamma functions. **(05 Marks)**

Module-5

9   a. Find Laplace transition of i) $t^2 e^{2t}$ ii) $\dfrac{e^{-at} - e^{-bt}}{t}$. **(06 Marks)**

    b. If a periodic function of period 2a is defined by $f(t) = \begin{cases} t & \text{if} & 0 \le t \le a \\ 2a-t & \text{if} & a \le t \le 2a \end{cases}$

    Then show that $L\{f(t)\} = \dfrac{1}{s^2}\tan h\left(\dfrac{as}{2}\right)$. **(05 Marks)**

    c. Solve $y''(t) + 4y'(t) + 4y(t) = e^t$ with $y(0) = 0$ $y'(0) = 0$. Using Laplace transform. **(05 Marks)**

OR

10 a. Find $L^{-1}\left[\dfrac{7s}{(4s^2 + 4s + 9)}\right]$ **(06 Marks)**

    b. Find $L^{-1}\left[\dfrac{s}{(s-1)(s^2+4)}\right]$ using convolution theorem. **(05 Marks)**

    c. Express the following function interms of Heaviside unit step function and hence its Laplace transistor $f(t) = \begin{cases} t^2, & 0 < t \le 2 \\ 4t, & t > 2 \end{cases}$ **(05 Marks)**

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USN `1 K S 1 6 E C 4 0 1`

First/Second Semester B.E Degree Examination, Dec.2019/Jan.2020
Constitution of India, Professional Ethics 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.

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1. The constitution of India was adopted and enacted on
   a) 26th January, 1950   b) 26th November, 1949
   c) 26th August, 1947   d) 26th December, 1949

2. The following word was added to the preamble by 42nd Amendment Act, 1976 to the constitution
   a) Sovereign   b) Republic   c) Democratic   d) Secular

3. The federal structure and provisions relating to Union-State relations contained in India constitution are based on the constitution of
   a) Germany   b) Australia   c) Canada   d) U.S.A

4. The important test to identify the basic features of the Indian constitution is
   a) Preamble   b) Directive principles of state policy
   c) Fundamental rights   d) Fundamental duties

5. Which of the following Act made the Indian Legislature bicameral for the first time?
   a) India Councils Act, 1909   b) Government of India Act, 1919
   c) Government of India Act, 1935   d) Indian Independence Act, 1947

6. Art.14, equality before law is not applicable to
   a) Prime minister   b) Chief justice of India   c) Vice president   d) Governor of a state

7. This is not the ground to impose restriction on the right to freedom of speech and expression
   a) National security   b) Law and order   c) Contempt of court   d) Morality or decency

8. Which Writ is issued by a high court or the supreme court to compel a public authority to perform a legal duty that it was not performing?
   a) Writ of certiorari
   b) Writ of Quo Warranto
   c) Writ of Mandamus
   d) Writ of prohibition

9. The aim of the directive principles of state policy is to establish a _____ in the country
   a) Socialist state
   b) Communist state
   c) Secular state
   d) Welfare state

10. The directive principles of state policy direct the state to secure
    a) Common civil code
    b) Uniform civil code
    c) Modern civil
    d) None of these

11. Indian Constitution provides _____ fundamental duties to the Indian citizens
    a) 09
    b) 10
    c) 11
    d) 12

12. Which among the following is not an integral part of the Indian parliament?
    a) The president
    b) The prime minister
    c) Lok Sabha
    d) Rajya Sabha

13. The vice – president of India is elected y the members of an electoral college consisting of
    a) Members of Lok sabha
    b) Member of Rajya Sabha
    c) Members of both houses of the parliament
    d) Elected members of Lok Sabha and Rajya Sabha

14. The union council of ministers shall be collectively responsible to the
    a) Prime minister
    b) President
    c) Rajya Sabha
    d) Lok Sabha

15. Who among the following certifies whether a bill is a money bill or an ordinary bill?
    a) President
    b) Speaker of Lok Sabha
    c) Prime minister
    d) Chairman of Rajya Sabha

16. Under the advisory jurisdiction, the supreme court of India gives its opinion to
    a) President
    b) Prime minister
    c) Union law minister
    d) Vice-president

17. The Governor of a state is
    a) Chosen by the chief minister
    b) Appointed by the president
    c) Appointed by the prime minister
    d) Elected by the citizens of that state

18. Which one of the following is a correct statement?
    a) All state legislatures in the country are Bicameral
    b) Half the state legislatures in the country are Bicameral
    c) only a few state legislature in the country are Bicameral
    d) All state legislatures in the country are unicameral

19. The state council of ministers has to tender their resignation if vote of no-confidence is passed against it by the
    a) Legislative assembly
    b) Legislative council
    c) Governor
    d) Joint session of both legislature assembly and legislature council

20. Election commission of India is a multi-member body, consisting of the chief election commissioner and _____ other election commissioners
   a) 2   b) 3   c) 4   d) 5

21. The election commission does not conduct election to the
   a) offices of the president and vice – president
   b) Parliament
   c) State legislatures
   d) Municipalities and Gram Panjayats

22. The procedure for amendment of the constitution is detailed under _____
   a) Article 360   b) Article 365   c) Article 368   d) Article 369

23. Article 21A – right to education as a fundamental right was added by _____ constitution amendment Act.
   a) 44th   b) 86th   c) 91st   d) 74th

24. _____ constitution Amendment Act has provided for the establishment of local self governing units municipal corporations, municipalities and Nagar Panchayats
   a) 42nd   b) 44th   c) 74th   d) 86th

25. Indian constitution guarantees reservation of seats to scheduled castes and scheduled tribes in
   a) Lok Sabha and state legislative assemblies
   b) Lok sabha only
   c) Rajya Sabha only
   d) State legislative assemblies only

26. Who are considered to be vulnerable group?
   a) Scheduled castes   b) Scheduled tribes   c) Women and children   d) All of these

27. The state shall provide free and compulsory education to all children of the age of _____
   a) 5 to 12 years   b) 6 to 14 years   c) 6 to 12 years   d) 5 to 16 years

28. National emergency can be proclaimed by the president of India on the ground of
   a) Internal disturbances   b) Political instability
   c) External aggression   d) National disasters

29. The Chairperson and members of the National Human rights commission of India are appointed by the
   a) Prime Minister   b) Chief Justice of India   c) Union Home Minister   d) Presidnet

30. Twelth schedule to the Indian constitution lists _____ subjects which are to be handled by the municipal corporations and municipalities
   a) 15   b) 18   c) 21   d) 24

31. There are about _____ gram Panchayats in India
   a) 2.00 lakhs   b) 2.50 lakhs   c) 2.75 lakhs   d) 3.00 lakhs

32. In a co-operative society, which one among the following is not the sole motive
   a) Promotion of thrift   b) Maximizing the profits
   c) Promotion of self-help   d) Promotion of mutual aid

33. Engineering ethics is _____
    a) A macro ethics
    b) Business ethics
    c) A preventive ethics
    d) A code of scientific rules based on ethics

34. Conflict of interest may be _____
    a) False   b) Potential   c) Imaginary   d) Create

35. As applied to responsibility, avoiding blame or being safe is the prime concern in
    a) Minimalist view   b) Reasonable care
    c) Good works view   d) Both (a)&(b)

36. _____ is not the symptoms of "Group thinking"
    a) Illusion of unanimity   b) Mind guarding
    c) Self-deception   d) Self - censorship

37. Revealing the confidential information means _____
    a) Breach of contract   b) Criminal breach of trust
    c) Violation of patent right   d) Misusing the truth

38. An expert testimony does not demand _____
    a) Consulting extensively with the lawyer
    b) Adequate time for thorough investigation
    c) Expert legal knowledge
    d) Objective and unbiased demeanor

39. The owner of the patent right retains his/her patent right for _____
    a) 10 year   b) 20 year   c) 30 year   d) 50 years

40. Acceptable risk means _____
    a) Risk which is the natural part of the process
    b) Risk which can be avoided
    c) Inevitable risk
    d) Risk of harm equal to probability of producing benefits.

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