CBCS SCHEME

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17MAT11

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Find the n^{th} derivative of $\sin 2x \cos x$. **(06 Marks)**

b. Prove that the following curves cuts orthogonally $r = a(1+\sin\theta)$ and $r = a(1-\sin\theta)$. **(07 Marks)**

c. Find the radius of the curvature of the curve $r = a\sin n\theta$ at the pole. **(07 Marks)**

OR

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

b. With usual notations, prove that $\tan\phi = \dfrac{\tau d\theta}{dr}$. **(07 Marks)**

c. Find the radius of curvature for the curve $n^2y = a(x^2+y^2)$ at (–2a, 2a). **(07 Marks)**

Module-2

3 a. Using Maclaurin's series prove that $\sqrt{1+\sin 2x} = 1 + x - \dfrac{x^2}{2} - \dfrac{x^3}{6} + \dfrac{x^4}{24} + \ldots$ **(06 Marks)**

b. If $U = \cot^{-1}\left(\dfrac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, prove that $x\dfrac{\partial U}{\partial x} + y\dfrac{\partial U}{\partial y} = -\dfrac{1}{4}\sin 2U$. **(07 Marks)**

c. Find the Jacobian of $u = x^2+y^2+z^2$, $v = xy+yz+zx$, $w = x+y+z$. **(07 Marks)**

OR

4 a. Evaluate $\lim\limits_{x\to 0}\left(\dfrac{\tan x}{x}\right)^{1/x}$. **(06 Marks)**

b. Find the Taylor's sense of log(cos x) about the point $x = \dfrac{\pi}{3}$ upto the third degree. **(07 Marks)**

c. If $u = f\left(\dfrac{x}{y}, \dfrac{y}{z}, \dfrac{z}{x}\right)$ prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

Module-3

5 a. If $x = t^2 + 1$, $y = 4t - 3$, $z = 2t^2 - 6t$ represents the parametric equation of a curve then, find velocity and acceleration at t = 1. **(06 Marks)**

b. Find the constants a and b such that $\vec{F} = (axy+z^3)i + (3x^2-z)j + (bxz^2-y)k$ is irrotational. Also find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

c. Prove that $\text{div}(\text{curl}\,\vec{A}) = 0$. **(07 Marks)**

OR

6 a. Find the component of velocity and acceleration for the curve $\vec{r} = 2t^2 i + (t^2 - 4t)j + (3t - 5)k$ at the points t = 1 in the direction of $i - 3j + 2k$. **(06 Marks)**

b. If $\vec{t} = \nabla(xy^3z^2)$, find div $\vec{t}$ and curl $\vec{t}$ at the point (1, –1, 1). **(07 Marks)**

c. Prove that curl(grad ϕ) = 0. **(07 Marks)**

Module-4

7 a. Prove that $\int_0^2 \frac{x^4}{\sqrt{4-x^2}} dx = 3\pi$ using reduction formula. **(06 Marks)**

b. Solve $(x^2 + y^2 + x)dx + xydy = 0$. **(07 Marks)**

c. Find the orthogonal trajectory of $r^n = a \sin n\theta$. **(07 Marks)**

OR

8 a. Find the reduction formula for $\int \cos^n xdy$ and hence evaluate $\int_0^{\pi/2} \cos^n xdx$. **(06 Marks)**

b. Solve $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$. **(07 Marks)**

c. A body in air at 25°C cools from 100°C to 75°C in 1 minute. Find the temperature of the body at the end of 3 minutes. **(07 Marks)**

Module-5

9 a. Find the rank of the matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing to row echelon form. **(06 Marks)**

b. Find the largest eigen and the corresponding eigen vector for $\begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$ by taking the initial approximation as $[1, 0.8, -0.8]^T$ by using power method. Carry out four iterations. **(07 Marks)**

c. Show that the transformation $y_1 = 2x_1 - 2x_2 - x_3$, $y_2 = -4x_1 + 5x_2 + 3x_3$, $y_3 = x_1 - x_2 - x_3$ is regular. Find the inverse transformation. **(07 Marks)**

OR

10 a. Solve the equations $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$ by using Gauss Seidal method. Carryout three iterations taking the initial approximation to the solution as (1, 0, 3). **(06 Marks)**

b. Diagonalize the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$. **(07 Marks)**

c. Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ into canonical form by orthogonal transformation. **(07 Marks)**

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17PHY12/22

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

Time: 3 hrs. Max. Marks: 100

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

2. ***Physical constants :*** $h = 6.624\times10^{-34}$ ***JS,*** $K = 1.38\times10^{-23}$ J/K, $N_A = 6.022\times10^{23}$ /mole, $m_e = 9.1\times10^{-31}$ ***kg.***

Module-1

1 a. Define phase velocity and group velocity. Derive the relation between them. **(06 Marks)**

b. Derive the expression for Eigen function and energy Eigen values for a particle inside a potential well of infinite height. **(07 Marks)**

c. Explain Heisenberg's uncertainity principle. Mention its physical significance. **(03 Marks)**

d. Find the kinetic energy and group velocity of an electron with De-Broglie wavelength of 0.2 nM. **(04 Marks)**

OR

2 a. What are the assumptions of Plank's law of radiation? Derive Wien's law and Rayleigh-Jean's law from Planck's law. **(07 Marks)**

b. Set up one dimensional time independent Schrodinger wave equation. **(06 Marks)**

c. What are matter waves? Give its properties. **(03 Marks)**

d. A spectral line of wavelength 546 nm has a width of 10^{-14} m. Evaluate the minimum time spent by the electron in the upper energy state between the excitation and deexcitation processes. **(04 Marks)**

Module-2

3 a. Explain failure of classical free electron theory. **(06 Marks)**

b. Discuss BCS theory of super conductivity. **(06 Marks)**

c. Explain Meissner effect. **(04 Marks)**

d. Calculate the number of donor atoms which must be added to an intrinsic semiconductor to obtain a conductivity of 2.2×10^{-4} mho/m. Given mobility of electrons = 125×10^{-3} m^2/VS. **(04 Marks)**

OR

4 a. Derive the expression for electrical conductivity of an intrinsic semiconductor. **(06 Marks)**

b. Define critical temperature and critical field for superconductivity. Explain temperature dependence of critical field. **(06 Marks)**

c. Define the terms : (i) Drift velocity (ii) Thermal velocity (iii) Relaxation time (iv) Mean collision time. **(04 Marks)**

d. Find the temperature at which there is 1% probability that a state with an energy 0.5 eV above Fermi level is occupied. **(04 Marks)**

Module-3

5 a. What is attenuation in optical fibers? Give the equation for attenuation coefficient. Explain different attenuation mechanisms. **(07 Marks)**

b. Derive an expression for energy density in terms of Einsteien's coefficients. **(06 Marks)**

c. Write a note on modes of propagation and V.number in optical fiber. **(04 Marks)**

d. The average output power of a laser emitting photons of wavelength 632.8 nm is 5 mW. Calculate the number of photons emitted per second by the laser beam. **(03 Marks)**

OR

6 a. Describe the construction and working of a semiconductor diode laser. **(06 Marks)**

b. Explain different types of optical fibers with suitable diagrams. **(06 Marks)**

c. Mention the properties of laser light. **(04 Marks)**

d. The attenuation of light in an optical fiber is 2.2 dB/km. If the input power is 100 MW. Calculate the output power after 2 km and 6 km. **(04 Marks)**

Module-4

7 a. Define packing factor. Obtain packing factor for simple cubic, bcc and fcc structures. **(07 Marks)**

b. What is Bragg's law? Describe how Bragg's spectrometer is used to determine the wavelength of X rays. **(06 Marks)**

c. Define allotrophy and polymorphism. **(03 Marks)**

d. Draw the following planes in a cubic unit cell:
(i) 100 (ii) (101) (iii) (111) (iv) (132) **(04 Marks)**

OR

8 a. What are Miller indices? Explain the procedure to find Miller indices of a plane with an example. **(06 Marks)**

b. Derive an expression for interplanar distance for a set of parallel planes having Miller indices (hKl). **(06 Marks)**

c. Discuss Perovskite structure. **(04 Marks)**

d. A monochromatic X ray beam of wavelength 0.7 Å undergoes first order Bragg reflection from (302) plane of a cubic crystal at a glancing angle of 35°. Calculate the lattice constant. **(04 Marks)**

Module-5

9 a. Define: (i) Mach number (ii) Subsonic wave (iii) Supersonic wave (iv) Hypersonic wave (iv) Mach angle. **(05 Marks)**

b. Give an account of Rankine-Hugoniot equations and mention the conservation laws. **(06 Marks)**

c. Discuss Ball milling method of synthesis of nanoparticles. **(05 Marks)**

d. What are carbon nanotubes? Mention their properties. **(04 Marks)**

OR

10 a. Describe the construction and working of Reddy tube. **(07 Marks)**

b. Describe the principle, construction and working of scanning electron microscope. Mention its applications. **(08 Marks)**

c. Describe arc discharge method of obtaining CNTs with the help of a diagram. **(05 Marks)**

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17PCD13/23

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Programming in C and Data Structures

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is pseudo code? Explain how pseudo code can be used to solve the problem with suitable example. **(06 Marks)**

b. Explain the structure of 'C' program with an example. **(08 Marks)**

c. What is type conversion? Explain the different types of conversion with example. **(06 Marks)**

OR

2 a. Explain scanf( ) function and write the guidelines to be followed to use printf( ) function. **(07 Marks)**

b. What is an operator? Explain the logical and bitwise operators. **(07 Marks)**

c. Define keyword, constant, identifiers with examples. **(06 Marks)**

Module-2

3 a. Explain cascaded if else and switch statement with syntax and example. **(08 Marks)**

b. Write a 'C' program to find the roofs of quadratic equation. **(08 Marks)**

c. Explain how break and continue statements are used in 'C' program. **(04 Marks)**

OR

4 a. Explain the different types of loops used in 'C' with syntax and example for each. **(09 Marks)**

b. Write a 'C' program to find whether a given no is palindrome or not. **(05 Marks)**

c. What are the nested loops? Write a 'C' program to print to multiplication table upto 'n' using nested for loops. **(06 Marks)**

Module-3

5 a. What is an Array? Explain the declaration and initialization of one dimensional array with example. **(07 Marks)**

b. Write a 'C' program to add two matrices. **(08 Marks)**

c. Explain Recursion with an example. **(05 Marks)**

OR

6 a. Explain any four string manipulation library functions with example. **(08 Marks)**

b. Explain function call, function definition and function prototype with example. **(08 Marks)**

c. What are actual parameters and format parameters? **(04 Marks)**

Module-4

7 a. What is structure? Explain with syntax and example, the concept of structure defining, declaration and initialization. **(10 Marks)**

b. Explain array of structures and structure within structure with example. **(10 Marks)**

OR

8 a. What is a file? Explain fopen( ), fclose( ) function with example. **(10 Marks)**

b. Give two university information files "studentname.txt" and "usn.tax" that contain studentname and USN respectively. Write a 'C' program to create a new file called "output.txt" and copy the content of "studentname.txt" and usn.txt" into "output.txt" file and then display on the screen. **(10 Marks)**

Module-5

9 a. What is a pointer? Explain how the pointer variable is declared and initialized. **(06 Marks)**

b. What is preprocessor directive? Explain #define, #include preprocessor directive. **(06 Marks)**

c. What is stack? Explain the operations performed on stack. **(08 Marks)**

OR

10 a. What is dynamic memory allocation? Write and explain the different dynamic memory allocation function in 'C'. **(08 Marks)**

b. What is queue? Explain the types of queues. **(06 Marks)**

c. What is a linked list? Distinguish between a singly linked list and doubly linked list. **(06 Marks)**

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CBCS SCHEME

USN 1KS17ME058

17ELE15/25

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

Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State and explain Kirchoff's laws. **(06 Marks)**

b. Coils A and B in a magnetic circuit have 600 and 500 turns respectively. A current of 8A in coil A produces a flux of 0.04Wb. If coefficient of magnetic coupling is 2. Calculate : i) self inductance of coil A ii) Mutual inductance iii) Average induced EMF in coil B, when flux with it changes from zero to full value in 0.02 sec. **(07 Marks)**

c. Determine the i) Current flowing through 12Ω and 8Ω resistances ii) Total power dissipated iii) Power dissipated in all resistors. **(07 Marks)**

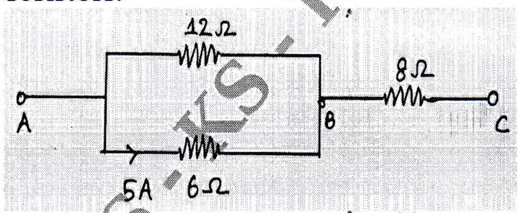

Fig.Q1(c)

OR

2 a. State and explain : i) Faraday's second law ii) Flemings left hand rule. **(06 Marks)**

b. Apply Kirchoff's laws to find pontifical difference between X and Y for below shown electrical circuit diagram IN Fig.Q2(b). **(07 Marks)**

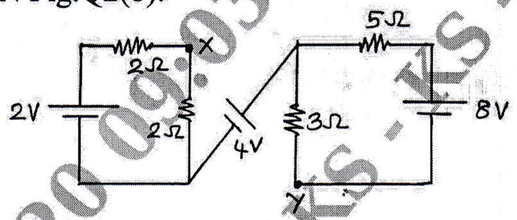

Fig.Q2(b)

c. Derive an expression for energy stored in magnetic field. **(07 Marks)**

Module-2

3 a. Explain the basic working principle of a DC motor. **(06 Marks)**

b. An 8 pole lap connected armature has 960 conductors, a flux of 40 mWb per pole and a speed of 400 RPM. Calculate the emf generated. If the armature were wave connected at what speed must it be driven to generate 400V? **(07 Marks)**

c. Explain the basic working principle of dynamometer type wattmeter with a neat diagram. **(07 Marks)**

OR

4 a. Discuss the classification of DC generators. **(06 Marks)**

b. A 4 pole, DC shunt motor takes 22A from 220V supply. The armature and field resistances are 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20 mWb. Calculate : i) Speed ii) Torque. **(07 Marks)**

c. Describe the working principle of single phase induction type energy meter with a neat diagram. **(07 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.

Module-3

5 a. Show that current 'i' lags the applied voltage 'v' by 90° in a pure inductive AC circuit and also power consumed is zero. **(06 Marks)**

b. A 200V, 50Hz inductive circuit takes a current of 10A lagging the voltage by 20°. Calculate the resistance and inductance of the circuit. Draw the waveforms of voltage and current. **(07 Marks)**

c. Explain : i) 2 way control of lamp ii) Conduit wiring with neat diagram. **(07 Marks)**

OR

6 a. List out the points for necessity of earthing. Explain the plate earthing a suitable diagram. **(06 Marks)**

b. Derive an expressions for RMS value and average value of sinusoidal AC current. **(07 Marks)**

c. Two impedances $(2 + j3)\Omega$ and $(3 - j4)\Omega$ are connected in parallel across 100Volts, 50Hz supply, Find : i) Branch currents ii) Total current in the circuit diagram. **(07 Marks)**

Module-4

7 a. Obtain the voltage and current relations for a balanced 3phase star connected system with suitable circuit and vector diagram. **(06 Marks)**

b. A balanced delta connected load of $(8 + j6)\Omega$ per phase is connected to a 3 phase 230Volts, 50Hz, AC supply. Find : i) Phase current ii) Line current iii) Power factor iv) Power v) Reactive power vi) Volt – Amp. **(07 Marks)**

c. A 6 pole, 3 phase, start connected alternator has an armature with 90 slots and 12 conductors per slot. If revolves at 1000 RPM, The flux per pole being 0.05 Web.
Calculate : i) Phase EMF ii) Line EMF. Assuming the winding factor is 0.97. **(07 Marks)**

OR

8 a. Explain the generation of 3 phase AC voltages with suitable diagrams. **(06 Marks)**

b. The power input to a 3 phase induction motor running on 400V, 50Hz, AC supply. The wattmeter readings were 3000W and –1000W calculate i) Total input power ii) Power factor iii) Line current. **(07 Marks)**

c. Explain the constructional features of non-salient pole type rotor. **(07 Marks)**

Module-5

9 a. Explain the basic working principle of transformer. **(06 Marks)**

b. A three phase 6 pole, 50Hz induction motor has a slip of 2% at No load and 4% at full load. Determine : i) Synchronous speed ii) Noload speed iii) Full load speed iv) frequency of rotor current at stand still v) Frequency of rotor current at full load. **(07 Marks)**

c. A 200KVA, 10,000/400V, 50Hz single phase transformer has 200 turns on the secondary. Calculate : i) Primary and secondary currents ii) Number of primary turns iii) Maximum value of flux iv) Flux density at Area = $18cm^2$. **(07 Marks)**

OR

10 a. List the various losses in transformer and discuss each one in brief with their minimization techniques. **(06 Marks)**

b. Describe the basic working principle of 3 phase induction motor and list the applications of induction motor. **(07 Marks)**

c. In a 25KVA, 2000/200V, single phase transformer, the iron and full load copper losses are 350W and 400W respectively. Calculate the efficiency at unity power factor on :
i) Full load ii) Half full load. **(07 Marks)**

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CBCS SCHEME

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17ELN15/25

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define the following diode parameters :
i) Static resistance ii) Dynamic resistance iii) Reverse saturation current
iv) Peak Inverse voltage v) Knee voltage. **(05 Marks)**

b. With circuit diagram and neat sketch, explain the common base input and output characteristics for pnp transistor. **(08 Marks)**

c. A full wave rectifier with a transformer secondary voltage 60V – 0 – 60V, supplies a load resistance $R_L = 2k\Omega$. The diode forward resistance R_f is 10Ω. Determine
i) maximum value of current in conducting diodes ii) dc value of current through R_L
iii) output dc voltage and iv) PIV across each diode. **(07 Marks)**

OR

2 a. With a neat circuit diagram and waveforms , explain the working of Bridge rectifier. **(08 Marks)**

b. A 9V reference source is to use a series connected zener diode and a resistor connected to 30V supply. If zener diode with $V_Z = 9V$, $I_{ZT} = 20mA$ is selected , then determine the value of series resistance and calculate the circuit current when the supply voltage drops to 27V. **(05 Marks)**

c. Define Common – base current gain and Common – emitter current gain of transistor. Derive the relationship between them. If a transistor has $I_C = 3mA$, $I_E = 3.03mA$, then find β of transistor. **(07 Marks)**

Module-2

3 a. With circuit diagram and necessary equations, explain the base bias circuit. **(05 Marks)**

b. For the voltage divider bias circuit using silicon transistor, $V_{cc} = 18V$, $R_1 = 33K\Omega$, $R_2 = 12K\Omega$, $R_c = 1.2K\Omega$ and $R_E = 1K\Omega$. Using approximate analysis, determine V_E , V_C , V_B , I_C and V_{CE}. **(08 Marks)**

c. With a neat circuit diagram, derive an equation for output voltage of non inverting amplifier using op - amp. **(07 Marks)**

OR

4 a. For the circuit shown in fig.Q4(a), find the Q – point values and draw the dc load line. The transistor has $V_{BE} = 0.7V$ and $\beta = 50$. **(07 Marks)**

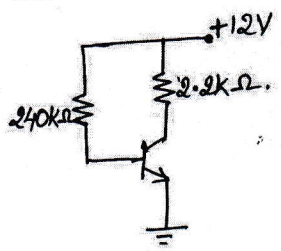

Fig.Q4(a)

b. Mention the characteristics of ideal op – amp. **(05 Marks)**

c. Calculate the output voltage for the circuit shown in fig.Q4(c). **(08 Marks)**

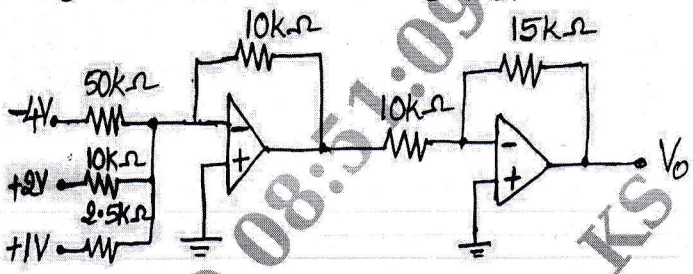

Fig.Q4(c)

Module-3

5 a. Convert the following : i) $(283.728)_{10} = (?)_8$. ii) $(AB.5E)_{16} = (?)_8$. **(06 Marks)**

b. Simplify $Y = \overline{A}BC + A\overline{B}C + ABC$ and then realize using
i) basic gates only ii) NOR gates only. **(08 Marks)**

c. Explain half adder circuit and realize using basic gates. **(06 Marks)**

OR

6 a. Subtract i) $(1011)_2 - (110)_2$ using 1's complement
ii) $(1001)_2 - (1110)_2$ using 2's complement. **(06 Marks)**

b. Draw the symbol and write the truth table of the exclusive – NOR gate and EX – OR gate. Realize the same using basic gates also. **(06 Marks)**

c. Simplify the following Bodean expressions :
i) $Y = A + \overline{A}B + ABC + A\overline{C}$ ii) $Y = (A + \overline{B} + \overline{C})(A + \overline{B} + C)$.
and realize using basic gates. **(08 Marks)**

Module-4

7 a. What is flipflop? Explain the operation of clocked RS flip flop. **(06 Marks)**

b. Explain the operation of NOR gate latch. **(06 Marks)**

c. With a neat block diagram, describe 8051 microcontroller. **(08 Marks)**

OR

8 a. Explain the operation of NAND gate latch. **(05 Marks)**

b. List the salient features of 8051 micro controller. **(07 Marks)**

c. Interface stepper motor to 8051 microcontroller with a neat block diagram. Explain its working principle, full step and half step sequence. **(08 Marks)**

Module-5

9 a. Explain the block diagram of communication system. **(06 Marks)**

b. The total power content of an AM wave is 2.64KW at a modulation index of 80%. Determine the power content of i) carrier ii) each sideband. **(04 Marks)**

c. Write a note on i) thermistor ii) photo electric transducer. **(10 Marks)**

OR

10 a. Give a comparison of AM and FM. **(06 Marks)**

b. With a neat circuit diagram, explain the demodulation of AM signal. **(06 Marks)**

c. Give the classification of transducers. Also mention the desirable properties of a good transducer. **(08 Marks)**

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CBCS SCHEME

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17CIV13/23

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain briefly the scope of the following civil engineering fields:
i) Surveying
ii) Structural Engineering. **(06 Marks)**

b. Explain briefly:
i) Equilibrium and Equilibrant
ii) Rigid body and elastic body
iii) Scalars and vectors. **(06 Marks)**

c. Two forces act at an angle of 120°. The bigger force is of 40kN and the resultant is perpendicular to the smaller force. Find the small force. **(08 Marks)**

OR

2 a. What is the role played by a civil engineering in the infrastructure development of a country? **(06 Marks)**

b. Draw a neat sketch of components of pavement. Explain it briefly. **(06 Marks)**

c. 4 forces acting at point '0', Determine the direction and magnitude of the resultant force with respect to the given axes of reference. **(08 Marks)**

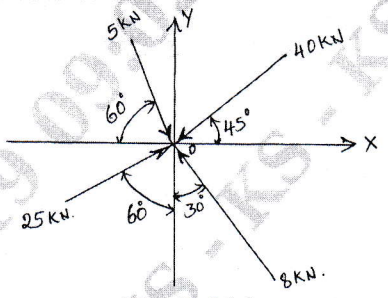

Fig.Q.2(c)

Module-2

3 a. Define: i) Angle of friction ii) Limiting friction iii) Coefficient of friction. **(06 Marks)**

b. A body of weight 100N is suspended by which two strings 5m and 4m length attached at same horizontal line 6m apart. Find tension in the strings. **(08 Marks)**

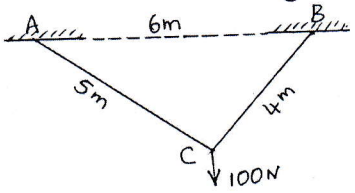

Fig.Q.3(b)

c. State and prove Lami's Theorem. **(06 Marks)**

OR

4 a. State the laws of friction. **(06 Marks)**

b. Explain the resolution of force. **(04 Marks)**

c. A string ABCD attached to two fixed points A and D has two equal weights of 100N attached to it at B and C. The weights rest with the portions AB and CD inclined at an angle of 30° and 60° respectively to the vertical as shown in Fig.Q4(c). Find the tensions in the portions AB, BC and CD of the string and also find the inclination of the portion BC with the vertical is 'θ'. **(10 Marks)**

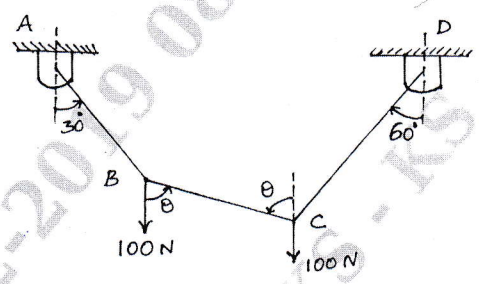

Fig.Q.4(c)

Module-3

5 a. Explain the different types of supports and types of loads with neat sketches. **(08 Marks)**

b. The system of forces acting on a body as shown in Fig.Q.5(b) below. Find forces R_1, R_2 and H. Show that the body is in equilibrium. **(12 Marks)**

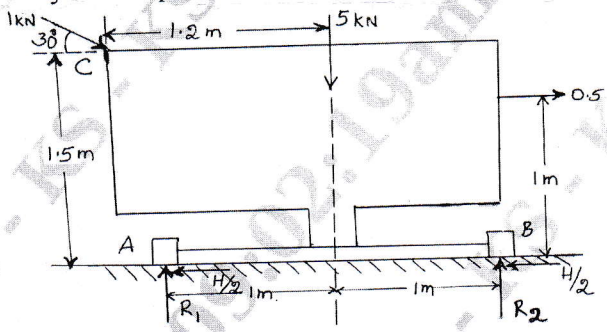

Fig.Q.5(b)

OR

6 a. State and prove the Varignon's theorem and its application. **(08 Marks)**

b. Find the reactions at all supports of the composite beam loaded as shown in Fig.Q.6(b) **(12 Marks)**

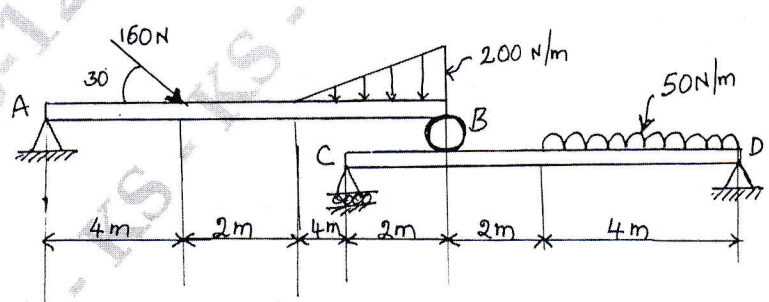

Fig.Q.6(b)

Module-4

7 a. Define:
i) Moment of Inertia
ii) Radius of gyration
iii) Polar moment of Inertia. **(06 Marks)**

b. Explain perpendicular Axis theorem. **(04 Marks)**

c. Determine the position of centroid of the shaded area of the Lamina shown in Fig.Q.7(c) with respect to '0'. **(10 Marks)**

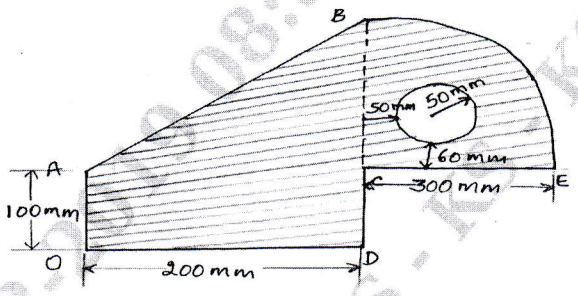

Fig.Q.7(c)

OR

8 a. Derive the expression for coordinates of centroid of a trapezium whose parallel sides are 'a' and 'b' and altitude h. **(10 Marks)**

b. Determine the moment of inertia of a section shown in Fig.Q.8(b) about the horizontal axis passing through the centroid. All dimension are in mm. Also find the radius of gyration. **(10 Marks)**

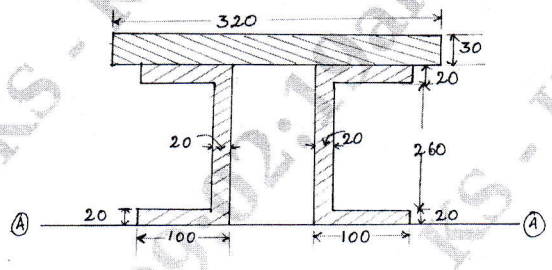

Fig.Q.8(b)

Module-5

9 a. A tower is 90m in height. A particle is droped from the top of the tower and at the same time another particle is projected upward from the foot of the tower. Both the particle meet at a height of 30m. Find the velocity with which the second particle is projected upward. **(10 Marks)**

b. A cricket ball thrown by a player from a height of 2m above the ground at an angle of 30° to the horizontal with a velocity 20m/sec is caught by another fieldsman at a height of 1m from the ground. Find the distance between the two players. **(10 Marks)**

OR

10 a. Calculate the super elevation required for a circular track of radius 250m. for a vehicle travelling at 50kmph. Also calculate the side thrust on such a super elevated road if the weight of the vehicle is 10kN and the speed is raised to 80kmph. **(10 Marks)**

b. Define projectiles. Explain the terms used with projectiles. **(06 Marks)**

c. To prove that the path traced by the projectile by a parabola. **(04 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

17EME14/24

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain with a neat sketch the working of a nuclear power plant. **(10 Marks)**

b. Distinguish between renewable and non-renewable source of energy with suitable examples. **(06 Marks)**

c. Explain higher calorific value and lower calorific value. **(04 Marks)**

OR

2 a. Explain the formation of steam at constant pressure, with suitable sketches. **(10 Marks)**

b. With a neat sketch, explain the working of a Bobcock and Wilcox boiler, show the path of flue gases. **(10 Marks)**

Module-2

3 a. Explain the principle of working of impulse and reaction turbine. **(10 Marks)**

b. Differentiate between open and closed cycle gas turbine. **(05 Marks)**

c. With a neat sketch, explain the working of Pelton wheel. **(05 Marks)**

OR

4 a. With the help of a PV diagram, explain the working of a four stroke diesel engine. **(10 Marks)**

b. The following observations were obtained during a trial on a four stroke diesel engine:

Cylinder diameter	= 25cm
Stroke of the piston	= 40cm
Crank shaft speed	= 250rpm
Brake load	= 70kg
Brake drum diameter	= 2m
Mean effective pressure	= 6bar
Diesel oil consumption	= $0.1 m^3$/min
Specific gravity of diesel	= 0.78
Calorific value of diesel	= 43900kJ/kg

Find:

i) Brake power
ii) Indicated power
iii) Frictional power
iv) Mechanical efficiency
v) Brake thermal efficiency
vi) Indicated thermal efficiency. **(10 Marks)**

Module-3

5 a. Explain the taper turning by swiveling of the compound rest, with a neat sketch. **(10 Marks)**
b. Explain Boring operation on a drilling machine with simple sketch. **(06 Marks)**
c. List out the various operations that can be performed on a milling machine. **(04 Marks)**

OR

6 a. With the help of simple diagrams, explain various types of Robot joints. **(10 Marks)**
b. Define automation. Explain different types of automation. **(10 Marks)**

Module-4

7 a. How do you classify engineering materials? **(05 Marks)**
b. Define composite material. Explain metal matrix composite and polymer matrix composite. **(10 Marks)**
c. State the various applications of composite materials. **(05 Marks)**

OR

8 a. Explain the principle of arc welding, with a neat sketch. **(10 Marks)**
b. What are the applications of welding? **(04 Marks)**
c. Differentiate between soldering and brazing. **(06 Marks)**

Module-5

9 a. Describe with a neat sketch the working of a vapour absorption refrigerator. **(10 Marks)**
b. Explain the basic concepts of refrigeration. **(06 Marks)**
c. Name the refrigerants that are commonly used. **(04 Marks)**

OR

10 a. Draw a neat sketch of a room air conditioner and explain its working principle. **(10 Marks)**
b. What are the properties of a good refrigerant? Explain. **(10 Marks)**

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CBCS SCHEME

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17MAT21

Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Solve $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$ (06 Marks)

b. Solve $(D^2 - 4)y = \text{Cosh}(2x - 1) + 3^x$ (07 Marks)

c. Solve $(D^2 + 1)y = \text{Sec}x$ by the method of variation of parameters. (07 Marks)

OR

2 a. Solve $D^3 - 9D^2 + 23D - 15)y = 0$ (06 Marks)

b. Solve $y'' - 4y' + 4y = 8(\text{Sin}2x + x^2)$ (07 Marks)

c. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2$ by the method of undetermined coefficients. (07 Marks)

Module-2

3 a. Solve $(x^2D^2 + xD + 1)y = \sin(2\log x)$ (06 Marks)

b. Solve $x^2p^2 + 3xyp + 2y^2 = 0$ (07 Marks)

c. Find the general and singular solution of Clairaut's equation $y = xp + p^2$. (07 Marks)

OR

4 a. Solve $(2x + 1)^2 y'' - 2(2x + 1)y' - 12y = 6x$ (06 Marks)

b. Solve $p^2 + 2py \cot x - y^2 = 0$ (07 Marks)

c. Find the general solution of $(p - 1)e^{3x} + p^3 e^{2y} = 0$ by using the substitution $X = e^x$, $Y = e^y$. (07 Marks)

Module-3

5 a. Form the partial differential equation by eliminating the function from $Z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$. (06 Marks)

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$ when $x = 0$ and $z = 0$ when y is an odd multiple of $\frac{\pi}{2}$. (07 Marks)

c. Derive one dimensional wave equation $\frac{\partial^2 U}{\partial t^2} = C^2 \frac{\partial^2 U}{\partial x^2}$. (07 Marks)

OR

6 a. Form the partial differential equation by eliminating the function from $f(x+y+z, x^2+y^2+z^2)=0$ **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial y^2}+z=0$ given that $z=\cos x$ and $\frac{\partial z}{\partial y}=\sin x$ when $y=0$. **(07 Marks)**

c. Obtain the variable separable solution of one dimensional heat equation $\frac{\partial U}{\partial t}=C^2\frac{\partial^2 U}{\partial x^2}$. **(07 Marks)**

Module-4

7 a. Evaluate $\int_0^2\int_1^2 (x^2+y^2)\,dx\,dy$ **(06 Marks)**

b. Evaluate $\int_0^\infty\int_x^\infty \frac{e^{-y}}{y}\,dy\,dx$ by changing the order of integration. **(07 Marks)**

c. Derive the relation between Beta and Gamma function as $B(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

OR

8 a. Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2+y^2+z^2)\,dx\,dy\,dz$ **(06 Marks)**

b. Find the area between the parabolas $y^2=4ax$ and $x^2=4ay$. **(07 Marks)**

c. Prove that $\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta \quad \int_0^{\pi/2}\frac{d\theta}{\sqrt{\sin\theta}}=\pi$ **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $\left[\frac{\cos at-\cos bt}{t}\right]$. **(06 Marks)**

b. Express the function $f(t)=\begin{cases}\sin t & 0<t\le\frac{\pi}{2}\\ \cos t & t>\frac{\pi}{2}\end{cases}$ in terms of unit step function and hence find Laplace transform. **(07 Marks)**

c. Find $L^{-1}\left(\frac{s+2}{s^2-2s+5}\right)$. **(07 Marks)**

OR

10 a. Find the Laplace transform of the periodic function $f(t)=t^2$, $0<t<2$. **(06 Marks)**

b. Using convolution theorem obtain the Inverse Laplace transform of $\frac{1}{s^3(s^2+1)}$. **(07 Marks)**

c. Solve by using Laplace transform $y''+4y'+4y=e^{-t}$. Given that $y(0)=0$, $y'(0)=0$. **(07 Marks)**

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