CBCS SCHEME

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18MAT11

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
Calculus and Linear Algebra

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Show that the curves $r^n = a^n \cos n\theta$ and $r^n = b^n \sin n\theta$ are intersect orthogonally. **(06 Marks)**

b. Find the radius of curvature of the curve $y = a \log \sec\left(\frac{x}{a}\right)$ at any point (x, y). **(06 Marks)**

c. Show that the evolute of the parabola $y^2 = 4ax$ is $27ay^2 = 4(x - 2a)^3$. **(08 Marks)**

OR

2 a. With usual notation, prove that $\tan\phi = r\frac{d\theta}{dr}$. **(06 Marks)**

b. Find the pedal equation of the curve $r = ae^{\theta \cot\alpha}$. **(06 Marks)**

c. Find the radius of curvature for the curve $r = a(1 + \cos\theta)$. **(08 Marks)**

Module-2

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

b. Evaluate $\lim_{x \to 0} \left(\frac{a^x + b^x + c^x + d^x}{4}\right)^{\frac{1}{x}}$. **(07 Marks)**

c. Find the dimensions of the rectangular box open at the top of maximum capacity whose surface is 432 sq.cm. **(07 Marks)**

OR

4 a. If $u = f(y - z, z - x, x - y)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. **(06 Marks)**

b. If $u = x^2 + y^2 + z^2$, $v = xy + yz + zx$, $w = x + y + z$. Find Jacobian $J = \frac{\partial(u, v, w)}{\partial(x, y, z)}$. **(07 Marks)**

c. Find the minimum value of $x^2 + y^2 + z^2$ subject to the condition $x + y + z = 3a$. **(07 Marks)**

Module-3

5 a. Evaluate $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)}dxdy$, by changing into polar coordinates. **(06 Marks)**

b. Find the volume of the tetrahedron bounded by the planes :

$x = 0, y = 0, z = 0, \frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1.$ **(07 Marks)**

c. Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

OR

6 a. Evaluate $\int_0^1\int_x^{\sqrt{x}} xy\,dy\,dx$ by change of order of integration. **(06 Marks)**

b. Evaluate $\int_{-1}^{1}\int_0^z\int_{x-z}^{x+z}(x+y+z)dy\,dx\,dz$. **(07 Marks)**

c. Prove that $\int_0^{\pi/2}\sqrt{\sin\theta}\,.\,d\theta \times \int_0^{\pi/2}\frac{1}{\sqrt{\sin\theta}}.\,d\theta = \pi$. **(07 Marks)**

Module-4

7 a. 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. **(06 Marks)**

b. Solve $\frac{dy}{dx}+\frac{y\cos x+\sin y+y}{\sin x+x\cos y+x}=0$. **(07 Marks)**

c. Solve $xyp^2-(x^2+y^2)p+xy=0$. **(07 Marks)**

OR

8 a. Solve $\frac{dy}{dx}+y\tan x = y^2\sec x$. **(06 Marks)**

b. Show that the family of parabolas $y^2 = 4a(x+a)$ is self orthogonal. **(07 Marks)**

c. Find the general solution of the equation $(px-y)(py+x)=0$ by reducing into Clairaut's from, taking the substitution $X = x^2, Y = y^2$. **(07 Marks)**

Module-5

9 a. Find the rank of the matrix :

$$A=\begin{bmatrix} 1 & 2 & -2 & 3 \\ 2 & 5 & -4 & 6 \\ -1 & -3 & 2 & -2 \\ 2 & 4 & -1 & 6 \end{bmatrix}.$$ **(07 Marks)**

b. Solve the system of equations :

$$12x + y + z = 31$$
$$2x + 8y - z = 24$$
$$3x + 4y + 10z = 58$$

By Gauss –Siedal method. **(07 Marks)**

c. Diagonalize the matrix :

$$A=\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}.$$ **(06 Marks)**

OR

10 a. For what values of λ and M the system of equations :

$$x + 2y + 3z = 6$$
$$x + 3y + 5z = 9$$
$$2x + 5y + \lambda z = M$$

has i) no solution ii) a unique solution iii) infinite number of solution. **(07 Marks)**

b. Find the largest eigen value and the corresponding eigen vector of :

$$A=\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

by Rayleigh's power method, use $[1\ 1\ 1]^T$ as the initial eigen vector (carry out 6 iterations). **(07 Marks)**

c. Solve the system of equations :

$$x + y + z = 9$$
$$2x + y - z = 0$$
$$2x + 5y + 7z = 52$$

By Gauss elimination method. **(06 Marks)**

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18PHY12

First Semester B.E. Degree Examination, Dec.2018/Jan.2019

Engineering Physics

Time: 3 hrs. Max. Marks: 100

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***
Planck's constant, $h = 6.63 \times 10^{-34}$ JS
Mass of electron, $m_e = 9.1 \times 10^{-31}$ kg
Charge of electron, $e = 1.6 \times 10^{-19}$ C
Boltzmann constant $= 1.38 \times 10^{-23}$ JK^{-1}
Avagadro number $= 6.02 \times 10^{23}$/mol.

Module-1

1 a. What are shock waves? Mention the characteristics and applications of shock waves. **(06 Marks)**

b. What are damped oscillations? Give the theory of damped oscillations and hence discuss the case of critical damping. **(10 Marks)**

c. A free particle is executing simple harmonic motion in a straight line with a period of 25 seconds; 5 seconds after it has crossed the equilibrium point, the velocity is found to be 0.7 m/s. Find the displacement at the end of 10 seconds and also amplitude of oscillations. **(04 Marks)**

OR

2 a. Define SHM. Mention the characteristics of SHM. Give one example of SHM. **(06 Marks)**

b. With a neat diagram, explain the construction and working of Reddy's shock tube. Mention conservation of mass energy and momentum expressions. **(10 Marks)**

c. A mass of 0.5kg causes on extension of 0.03m in a spring and the system is set for oscillations. Find i) The force constant for the spring ii) Angular frequency and iii) Time period of the resulting oscillation. **(04 Marks)**

Module-2

3 a. State and explain Hooke's law. Define elastic and plastic limits. **(06 Marks)**

b. Define Young's modulus of materials. Derive an expression for the Young's modulus of a beam using single cantilever method. **(10 Marks)**

c. Calculate the torque required to twist a wire of length 1.5m, radius 0.0425×10^{-2}m through an angle of $(\pi/45)$ radians, if the value of rigidity modulus of the material is 8.3×10^{10}N/m^2. **(04 Marks)**

OR

4 a. What is Bending moment? Mention various types of beams and their engineering applications (any four). **(06 Marks)**

b. What are the types of Elastic moduli? Derive a relation between Y, K and σ. **(10 Marks)**

c. Calculate the Force required to produce an extension of 1mm in steel wire of length 2m and diameter 1mm. ($Y = 2 \times 10^{11}$ N/m^2) **(04 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. What is Numerical Aperture? Derive an expression for the same. **(06 Marks)**

b. State and explain Maxwell's equation for electromagnetic field. Starting from Maxwell's equations, deduce the wave equation for a plane wave in free space. **(10 Marks)**

c. Determine constant C, such that $\vec{A} = (x + ay)\hat{a}_x + (y + bz)\hat{a}_y + (x + cz)\hat{a}_z$ is solenoidal. **(04 Marks)**

OR

6 a. Explain the types of fiber losses. **(06 Marks)**

b. State and explain Gauss Divergence theorem. Mention the Stoke's theorem. **(10 Marks)**

c. The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. **(04 Marks)**

Module-4

7 a. Setup one dimensional time independent Schrödinger wave equation. **(06 Marks)**

b. Mention the three modes of vibration in CO_2 molecule. With neat diagrams explain the construction and working of CO_2 laser. **(10 Marks)**

c. A pulsed laser emits photons of wavelength 780nm with 20mW average power/pulse. Calculate the number of photons contained in each pulse if the pulse duration is 10ns. **(04 Marks)**

OR

8 a. Prove that electron cannot exist inside the Nucleus of an atom. **(06 Marks)**

b. Derive an expression for energy density in terms of Einstein's coefficients. **(10 Marks)**

c. An electron is bound in a one dimensional potential well of width 1Å, but infinite wall height. Find its energy values in the ground state and in the first two excited states. **(04 Marks)**

Module-5

9 a. What are the assumptions of Quantum Free Electron Theory (QFET)? Explain the merits of QFET. **(06 Marks)**

b. What is Hall Effect? Derive an expression for Hall voltage interms of Hall coefficient. **(10 Marks)**

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

OR

10 a. What is polarization? Explain various types of polarizations mechanisms. **(06 Marks)**

b. What is Fermi Energy? Derive an expression for Fermi Energy at zero Kelvin for a metal. **(10 Marks)**

c. The resistivity of intrinsic germanium at 27°C is equal to 0.47 ohm-m. Assuming the electron and hole mobilities as 0.38 and 0.18 m^2/V-Sec respectively. Calculate the intrinsic carrier density. **(04 Marks)**

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18CHE12

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Chemistry

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define terms : (i) Free energy (ii) Entropy (iii) Cell potential. **(06 Marks)**

b. For the cell, Fe | Fe^{2+}(0.01M) || Ag^{+} (0.1M) | Ag, write the cell reaction and calculate the e.m.f of cell at 298 K, if standard potentials of Fe and Ag electrodes are – 0.44 V and +0.8V respectively. **(07 Marks)**

c. What are Secondary Batteries? Explain the construction and working of Nickel – metal hydride (Ni - MH) battery. Mention its applications. **(07 Marks)**

OR

2 a. Define Primary, Secondary and Reserve batteries with examples. **(06 Marks)**

b. What are concentration cells? The cell potential of copper concentration cell Cu | $CuSO_4$ (0.005M) || $CuSO_4$ (X) | Cu is 0.0295 V at 25°C. Calculate the value of X. **(06 Marks)**

c. Explain the construction and working of glass electrode giving its application in determination of pH of solution. **(08 Marks)**

Module-2

3 a. Define corrosion. Describe the electrochemical theory of corrosion taking rusting of iron as an example. **(07 Marks)**

b. Explain (i) Water line corrosion (ii) Pitting corrosion. **(06 Marks)**

c. What is electroless plating? Explain electroless plating of Nickel. **(07 Marks)**

OR

4 a. What is meant by metal finishing? Mention (any five) technological importance of metal finishing. **(06 Marks)**

b. Explain the process of (i) Galvanizing (ii) Anodising of Aℓ. **(07 Marks)**

c. What is electroplating? Explain electroplating of chromium. Mention why chromium cannot be used as anode. **(07 Marks)**

Module-3

5 a. Define calorific value of fuel. Explain the experimental determination of calorific value of solid / liquid fuel using Bomb calorimeter. **(08 Marks)**

b. What are fuel cells? Describe the construction and working of Solid Oxide Fuel Cell (SOFC). **(06 Marks)**

c. What are Solar cells? Explain the construction and working of photovoltaic (PV) cell. **(06 Marks)**

OR

6 a. Explain the preparation of solar grade Silicon by Union Carbide process. **(07 Marks)**

b. Write a note on (i) Power alcohol (ii) Unleaded petrol. **(06 Marks)**

c. 0.75 g of coal sample (Carbon 90%, H_2 5% and ash 5%) was subjected to combustion in Bomb calorimeter. Mass of water taken in calorimeter was 2.5 kg and the water equivalent of calorimeter is 0.65 kg. The rise in temperature was found to be 3.2°C. Calculate higher and lower calorific values of the sample. Latent heat of steam = 2457 kJ/kg and specific heat of water = 4.187 kJ/kg/°C. **(07 Marks)**

Module-4

7 a. What are the causes, effects and disposal methods of e-waste? **(07 Marks)**

b. What are the sources, effects and control of lead pollution? (Pb pollution). **(07 Marks)**

c. In a COD test, 30.2 cm^3 and 14.5 cm^3 of 0.05 N FAS solutions are required for a Blank and Sample titration respectively. The volume test sample used was 25 cm^3. Calculate the COD of the sample solution. **(06 Marks)**

OR

8 a. Explain the sources, effects and control of oxides of nitrogen. **(07 Marks)**

b. Explain softening of water by ion exchange method. **(07 Marks)**

c. Explain the Activated sludge treatment of sewage water. **(06 Marks)**

Module-5

9 a. Explain the theory, instrumentation and application of Atomic absorption spectroscopy. **(07 Marks)**

b. Explain the theory and instrumentation of potentiometry. **(07 Marks)**

c. Write a note on Fullerene. Mention its application. **(06 Marks)**

OR

10 a. What are Nanomaterials? Explain the synthesis of nanomaterials by precipitation method. **(07 Marks)**

b. Explain the synthesis of Nano materials by Sol-Gel technique. **(06 Marks)**

c. Explain the theory and instrumentation of conductometry. **(07 Marks)**

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18CPS13

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
C Programming for Problem Solving

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the basic structure of a C program with example. **(10 Marks)**

b. Define a variable. Explain the rules for constructing variables in C language. **(04 Marks)**

c. Write a C program to compute simple interest. Draw the flowchart for the same. **(06 Marks)**

OR

2 a. Define data type. Explain primitive data types supported by C language with example. **(10 Marks)**

b. List all the operators used in C language and evaluate following expression.

i) $x = a - b/3 + c * 2 - 1$ when $a = 9$, $b = 12$, $c = 3$

ii) $10! = 10 \,||\, 5 < 4 \,\&\, \&\, 8$. **(04 Marks)**

c. Describe the various type computers. **(06 Marks)**

Module-2

3 a. Explain the formatted I/O functions of C language with syntax and example. **(04 Marks)**

b. Write a C program to implement commercial calculator using switch statement. **(06 Marks)**

c. Write the syntax of different branching statements and explain their working. **(10 Marks)**

OR

4 a. Differentiate between while loop and do-while loop. Explain with syntax and example. **(08 Marks)**

b. Write a program to find the sum of N natural numbers using for loop. **(04 Marks)**

c. Write a C program to plot Pascal's triangle. **(08 Marks)**

Module-3

5 a. Define array. Write the syntax for and with declaring and initializing 1D and 2D array with suitable example. **(10 Marks)**

b. Write a C program to find the transpose of a give matrix. **(10 Marks)**

OR

6 a. Define string. List out all string manipulation function. Explain any two with examples. **(10 Marks)**

b. Write a C program for [consider integer data] :
i) Bubble sort ii) Linear search. **(10 Marks)**

Module-4

7 a. What is a function? Explain the different type of functions based on parameter. **(10 Marks)**
b. Write a program to find the factorial of a given number using functions. **(14 Marks)**
c. Write a program to find GCD and LCM of two numbers using concept of functions. **(06 Marks)**

OR

8 a. Explain recursion and write a program to find n^{th} term of Fibonacci series. **(10 Marks)**
b. Give the scope and lifetime of following :
i) External variable ii) Static variable iii) Automatic variable
iv) Static variable iv) Register variable. **(10 Marks)**

Module-5

9 a. What is a structure? Explain the syntax of structure declaration in C with example. **(04 Marks)**
b. Write note on : i) Arrays within structures ii) arrays of structures. **(04 Marks)**
c. Implement structures to read, write and compute average marks and the students scoring above and below average marks for class of N students. **(12 Marks)**

OR

10 a. What is a pointer? Show how pointer variable is declared and initialized. **(05 Marks)**
b. Explain any two preprocessor directives in C. **(05 Marks)**
c. Write a C program to find sum and mean of all elements is an array using pointer. **(10 Marks)**

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CBCS SCHEME

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18ELE13

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State and explain Kirchhoff's laws as applied to an electric circuit. **(06 Marks)**

b. Given the network shown in Fig. Q1 (b), determine I_1, E, I_3 and I. If voltage across 9 Ω resistor is 27 V. **(08 Marks)**

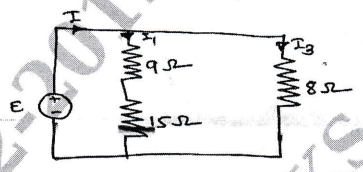

Fig. Q1 (b)

c. Derive the equation for root-mean-square value of an alternating current in terms of maximum value. **(06 Marks)**

OR

2 a. Define the (i) Frequency (ii) Form factor & (iii) Peak factor of sinusoidally varying voltage. **(06 Marks)**

b. The instantaneous values of two alternating voltages are represented respectively by $V_1 = 60\sin\theta$ volts and $V_2 = 40\sin\left(\theta - \frac{\pi}{3}\right)$ volts. Derive an expression for instantaneous value of : (i) the sum (ii) the difference of these voltages. **(08 Marks)**

c. For the network shown in Fig. Q2, calculate the power consumed by each resistor. **(06 Marks)**

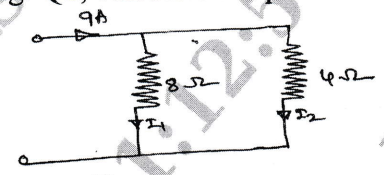

Fig. Q2

Module-2

3 a. Show that voltage and current in pure resistive circuit are in phase and power consumed in the circuit is equal to product of rms voltage and current. The circuit is excited by the a.c. source. **(06 Marks)**

b. A resistance of 7 Ω is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V, 50 Hz, sinusoidal supply. Calculate
(i) Circuit current (ii) Phase angle (iii) Power factor (iv) Power. **(08 Marks)**

c. Two wattmeters are used to measure power in a 3-phase balanced load. The wattmeter readings are 8.2 kW and 7.5 kW. Calculate (i) Total power (ii) Power factor and (iii) Total reactive power. **(06 Marks)**

OR

4 a. Deduce the relationship between the phase and the line voltages of a three phase star connected system. **(06 Marks)**

b. Three coils are connected in delta to a three phase, three wire, 400 V, 50 Hz supply and take a line current of 5 A at 0.8 p.f. lagging. Calculate the resistance and inductance of the coils. **(06 Marks)**

c. A coil having a resistance of 20 Ω and inductance of 0.0382 H, is connected in parallel with a circuit consisting of a 150 μF capacitor in series with 10 Ω resistor. The arrangement is connected to a 230 V, 50 Hz supply. Determine current in each branch. Also find total supply current. **(08 Marks)**

Module-3

5 a. Explain the construction of a single phase transformer. **(06 Marks)**

b. A 50 KVA single phase transformer has primary and secondary turns of 300 and 20 respectively. The primary winding is connected to a 2200 V, 50 Hz supply.
Calculate (i) No load secondary voltage (ii) approximate values of the primary and secondary currents on full load (iii) Maximum value of flux density. **(06 Marks)**

c. With neat diagram, explain plate earthing. **(08 Marks)**

OR

6 a. Derive E.M.F equation of single phase transformer. **(06 Marks)**

b. With neat circuit and truth table, explain three way control of lamp. **(06 Marks)**

c. A 400 KVA transformer has a core loss of 2 kW and maximum efficiency at 0.8 p.f. occurs when the load is 240 kW. Calculate (i) The maximum efficiency at unity power factor. (ii) the efficiency on full load at 0.71 power factor. **(08 Marks)**

Module-4

7 a. Draw a labeled diagram of the cross section of a d.c. generator. What are the essential functions of the field coils, armature, commutator and brushes? **(08 Marks)**

b. A four-pole armature of d.c. generator has 624 lap-connected conductors and is driven at 1200 rpm. Calculate the useful flux per pole required to generate an E.M.F of 250 V. **(06 Marks)**

c. A four pole motor is fed at 440 V and takes an armature current of 50 A. The resistance of the armature circuit is 0.28 ohm. The armature winding is wave-connected with 888 conductors and useful flux per pole is 0.023 wb. Calculate back emf and speed. **(06 Marks)**

OR

8 a. Obtain from first principles an expression for torque developed in d.c. motor. **(06 Marks)**

b. Explain characteristics of d.c. shunt motor. **(06 Marks)**

c. A shunt generator running at 500 rpm delivers 50 kW at 200 V. The armature and field resistances are 0.02 and 40 Ω respectively. Calculate generated E.M.F if brush drop of 1 V per brush. **(08 Marks)**

Module-5

9 a. By means of a diagram, describe the main parts of synchronous generator with their functions. **(08 Marks)**

b. The stator of a 3-phase, 8 pole, 750 rpm alternator has 72 slots, each of which contains 10 conductors. Calculate the rms value of the emf per phase if flux per pole is 0.1 wb sinusoidally distributed. Assume full pitch coils and winding distribution factor of 0.96. **(06 Marks)**

c. A 4-pole, 3300 V, 50 Hz induction motor runs at rated frequency and voltage. The frequency of the rotor currents is 2.5 Hz. Find slip and running speed. **(06 Marks)**

OR

10 a. Deduce an expression for the frequency of rotor current in an induction motor. **(06 Marks)**

b. A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate,
(i) Synchronous speed.
(ii) The speed of the rotor when the slip is 0.04.
(iii) The frequency of the rotor current when the slip is 0.03.
(iv) The frequency of the rotor current at standstill. **(08 Marks)**

c. Derive e.m.f equation for synchronous generator. **(06 Marks)**

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CBCS SCHEME

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18ELN14

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Explain the working of PN junction diode under forward and reverse biased conditions. **(06 Marks)**

b. Explain how zener diode helps in voltage regulation with neat circuit diagram. **(06 Marks)**

c. Explain with neat circuit diagram and waveforms the working of center-tap full wave rectifier. Show that efficiency of full-wave rectifier is 81%. **(08 Marks)**

OR

2 a. Explain the operation of half-wave rectifier with capacitor filter with neat circuit diagram and waveforms. **(06 Marks)**

b. Show that the ripple factor of a half-wave rectifier is 1.21 and efficiency is 40.5%. **(06 Marks)**

c. Explain VI characteristics of photodiode and its operation. **(04 Marks)**

d. For the circuit shown in Fig.Q2(d) find (i) current and voltages in the circuit for $R_L = 450\ \Omega$.

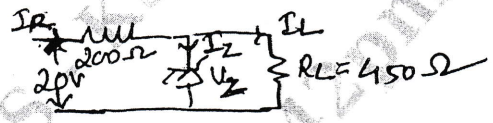

Fig.Q2(d) **(04 Marks)**

Module-2

3 a. Explain the drain and transfer characteristics of a JFET with neat circuit diagram. **(08 Marks)**

b. Explain the basic structure and operation of JFET with neat diagrams. **(08 Marks)**

c. For a JFET $I_{DSS} = 9$ mA and $V_{GS(off)} = -8\ V_{(max)}$ determine drain current for $V_{GS} = -4V$. **(04 Marks)**

OR

4 a. Explain the operation of an enhancement MOSFET with neat circuit diagram. **(06 Marks)**

b. Explain CMOS as an inverter with neat circuit diagram. Give its equivalent circuit and its advantages. **(08 Marks)**

c. Explain VI characteristics of SCR. **(06 Marks)**

Module-3

5 a. Explain the block diagram of an operational amplifier. **(06 Marks)**

b. Explain the operation of an op-amp as a non-inverting amplifier with neat diagram and waveforms. **(06 Marks)**

c. Define the following terms with respect to op-amp.
(i) CMRR (ii) Slewrate (iii) µp offset voltage and current (iv) µp bias current **(08 Marks)**

OR

6 a. Explain op-amp as a subtractor with neat circuit diagram. **(08 Marks)**

b. Explain the different µp modes of an op-amp. **(06 Marks)**

c. For an op-amp circuit shown in Fig.Q6(c), find the output Vo_1 and Vo_2.

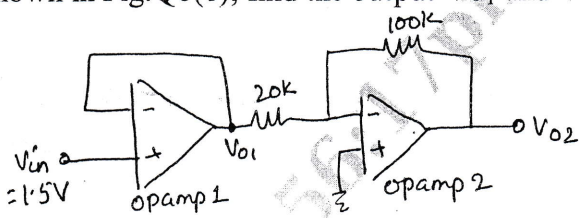

Fig.Q6(c)

Also write the function of each op-amp used. **(06 Marks)**

Module-4

7 a. With neat circuit diagram explain how transistor is used as an voltage amplifier. Derive an equation for A_v. **(08 Marks)**

b. Explain the voltage series feedback circuit and derive an equation for voltage gain A_v with feedback. **(04 Marks)**

c. Explain RC phase-shift oscillator with circuit diagram and necessary equations. **(08 Marks)**

OR

8 a. With neat circuit diagram explain how transistor can be used to switch an LED ON/OFF and give the necessary equation. **(08 Marks)**

b. The transistor in common emitter configuration is shown in Fig.Q8(b) with $R_c = 10\ k\Omega$ and $\beta_{DC} = 200$ determine

(i) V_{CE} at $V_{in} = 0$ (ii) $I_{B(min)}$ to saturate the collector current (iii) $R_{B(max)}$ when $V_{in} = 5V$. $V_{CE(sat)}$ can be neglected. **(04 Marks)**

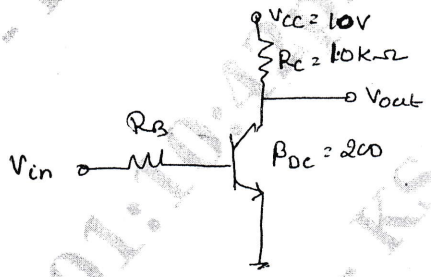

Fig.Q8(b)

c. Explain the operation of IC-555 as an Astable oscillator with neat circuit diagram and necessary equation. **(08 Marks)**

Module-5

9 a. Design Full adder circuit and implement it using basic gates. **(10 Marks)**

b. Explain the basic elements of communication system with block diagram. **(06 Marks)**

c. Find

(i) $(1010111011110101)_2 = (\ ?\ )_{16}$ (ii) $(FA876)_{16} = (\ ?\ )_2$ **(04 Marks)**

OR

10 a. State and prove De Morgan's theorems. **(04 Marks)**

b. Explain the working of a 3-bit ripple counter with neat circuit diagram and timing diagrams. **(08 Marks)**

c. Explain the working of RS flip flop with truth table and diagram. **(06 Marks)**

d. Subtract the following using 2's complement:

(i) 11100 - 1001.1 **(02 Marks)**

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CBCS SCHEME

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18ME15

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Thermodynamic data hand book is permitted.

Module-1

1 a. Explain briefly the principle of conversion of solar energy directly into electrical energy in a solar cell. **(10 Marks)**

b. Write a note on wind energy and its conversion. **(10 Marks)**

OR

2 a. Explain I - law of thermodynamics. List the similarities and dissimilarities between work and heat. **(10 Marks)**

b. Define the following term in relation to steam:
(i) Dryness fraction
(ii) Latent heat
(iii) Degree of super heat
(iv) Saturation temperature **(10 Marks)**

Module-2

3 a. Differentiate between water tube boiler and fire tube boiler. **(04 Marks)**

b. List the boiler mountings and accessories and also mention their uses. **(06 Marks)**

c. With neat sketch explain the working of Babcock and Wilcox boiler. **(10 Marks)**

OR

4 a. With a neat sketch explain the working of Pelton Wheel. **(10 Marks)**

b. With a neat sketch explain the working of a Reciprocating pump, state the advantages and uses. **(10 Marks)**

Module-3

5 a. Differentiate between Two-stroke and Four stroke engine. **(04 Marks)**

b. Explain with neat sketch construction and working of 4-stroke diesel engine with the help of theoretical P-V diagram. **(10 Marks)**

c. A four stroke single cylinder Diesel engine piston diameter 250 mm and stroke 400 mm. The mean effective pressure is 4-bar and speed is 500 rpm. Diameter of the brake drum is 1000mm. The effective brake load is 400 N. Find IP, BP and FP. **(06 Marks)**

OR

6 a. What are the properties of good refrigerant? **(04 Marks)**

b. Explain with neat sketch working principle of vapour compression refrigeration. **(10 Marks)**

c. Explain the following :
(i) Refrigeration effect
(ii) Ton of refrigeration
(iii) COP. **(06 Marks)**

Module-4

7 a. Write a note on application of ferrous and non-ferrous alloys. **(06 Marks)**

b. Define composite material. State the advantages and applications of composite material. **(05 Marks)**

c. Differentiate between Soldering, Brazing and Welding. **(09 Marks)**

OR

8 a. Differentiate between Open and Crossed belt drive. **(06 Marks)**

b. Enumerate the advantages and disadvantages of gear drive over belt drive. **(06 Marks)**

c. Derive an equation for length of belt in open belt drive. **(08 Marks)**

Module-5

9 a. Explain the following operation on lathe with suitable sketches:
(i) Turning (ii) Knurling (iii) Facing (iv) Thread cutting **(10 Marks)**

b. Explain the following operation on milling machine with suitable sketches:
(i) Form milling (ii) Angular milling (iii) Gang milling **(10 Marks)**

OR

10 a. Differentiate between open loop and closed loop systems. **(06 Marks)**

b. Define robot. Write down industrial applications of robot. **(04 Marks)**

c. Explain the components of CNC with a block diagram. **(10 Marks)**

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18CIV14

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Briefly explain the scopes of branches:
i) Transportation Engineering
ii) Geotechnical Engineering. **(10 Marks)**

b. What are the effects of infrastructural facilities on socio-economic development of a country? **(05 Marks)**

c. What is the role of a civil engineer in infrastructural development of a country? **(05 Marks)**

OR

2 a. Explain briefly,
i) Law of physical independency of forces.
ii) Law of superposition of forces. **(06 Marks)**

b. State and prove Varignon's law of moments. **(06 Marks)**

c. Find the moment of 100kN force acting on a rigid body ABC as shown in Fig.Q.2(c), about point A. **(08 Marks)**

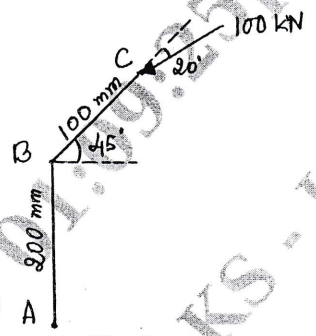

Fig.Q.2(c)

Module-2

3 a. Define Free Body Diagram, with the help of at least two examples. What is the importance of drawing a F.B.D (Free Body Diagram) in Engineering Mechanics? **(05 Marks)**

b. What are the laws of dry friction? **(05 Marks)**

c. A mass of 580 kg resting on a rough inclined plane is acted upon by a 6000N force as shown in Fig.Q.3(c). If the coefficient of friction is 0.25 at point of contact, check whether the body slides up or down. **(10 Marks)**

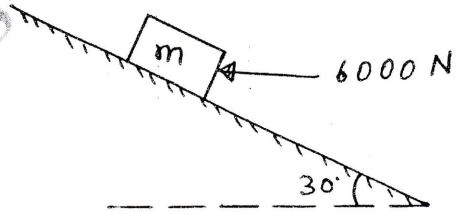

Fig.Q.3(c)

OR

4 a. State and prove Lami's theorem. **(04 Marks)**

b. Find the reactions developed at contact points A, B and C supporting two identical rollers each of weight 1000N as shown in Fig.Q.4(b) **(06 Marks)**

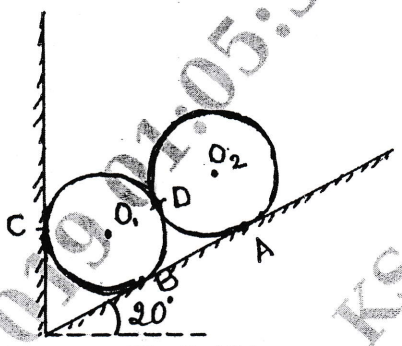

Fig.Q.4(b)

c. A ladder 4m long and weighing 200N is placed against a vertical wall and rests on a horizontal floor making an angle 60° with the floor. The coefficient of friction between ladder and floor is 0.3 and that between ladder and wall is 0.2. The ladder in addition to its own weight supports a person weighing 600N at a distance of 3m from the floor along the ladder. Calculate the minimum force 'P' to be applied horizontally at the floor level on the ladder to keep it in equilibrium. **(10 Marks)**

Module-3

5 a. Determine the support reactions in case of a simply supported beam shown in Fig.Q.5(a). **(06 Marks)**

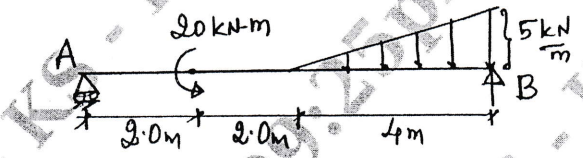

Fig.Q.5(a)

b. Analyze the truss shown in Fig.Q5(b) to find member forces in member BC, CH and GH by method of sections. **(14 Marks)**

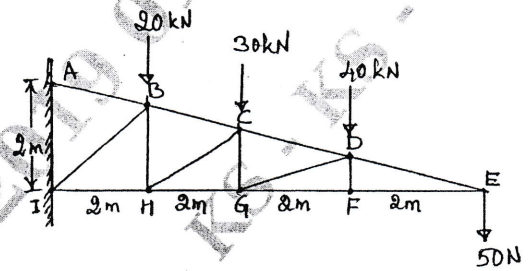

Fig.Q5(b)

OR

6 a. Differentiate statically determinate and indeterminate structures with examples for each. **(06 Marks)**

b. Determine member forces in the truss shown in Fig.Q.6(b). **(14 Marks)**

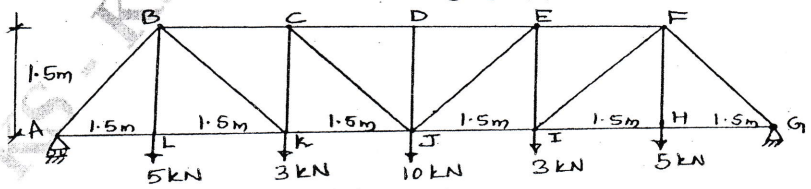

Fig.Q.6(b)

Module-4

7 a. Derive the expression for centroid of a semi-circle from first principle. **(06 Marks)**

b. Determine the centroid of shaded area of composite shown in Fig.Q.7(b) with respect to origin 'O'. **(14 Marks)**

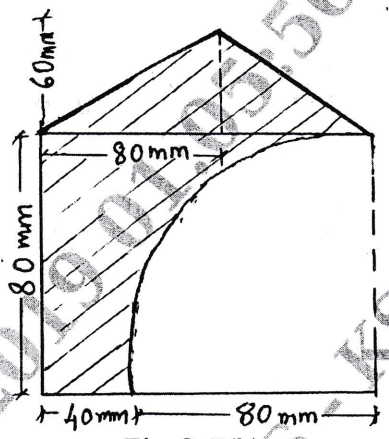

Fig.Q.7(b)

OR

8 a. State and prove Parallel axis theorem. **(06 Marks)**

b. Find radius of gyration of plane lamina about its horizontal centroidal axis shown in Fig.Q.8(b). **(14 Marks)**

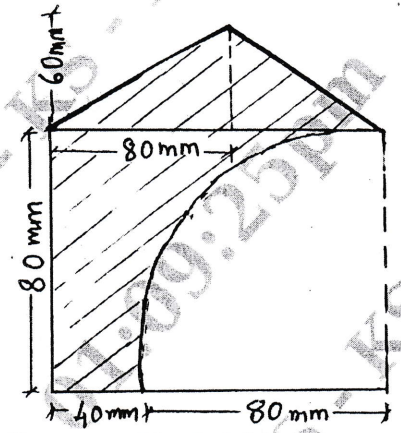

Fig.Q.8(b)

Module-5

9 a. Two cars P and Q accelerates from a standing start. The acceleration of P is 1.3 m/s^2 and that of Q is 1.6 m/s^2. If Q was originally 6m behind P, how long it takes to overtake P? **(10 Marks)**

b. A stone 'A' is dropped from top of a tower 50m heigh. At the same time another stone 'B' is thrown up from the foot of the tower with the velocity of 25m/s. At what distance from top and after how much time the two stones will cross each other. **(10 Marks)**

OR

10 a. State D' Alembert's principle and write significance of it structural dynamics. **(06 Marks)**

b. A cricket ball is thrown by a fielder in the ground from a height of 3m at an angle of 40° with the horizontal. The velocity with which the ball is thrown is 30m/s. The ball hits the wicket at a height of 0.3m from ground. Determine the distance of the fielder from the wicket when the ball is thrown. **(14 Marks)**

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