CBCS SCHEME

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18PHY12/22

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 $h = 6.63 \times 10^{-34}$ J-S : Mass of an electron $m = 9.11 \times 10^{-31}$ kg Beltzmann constant $K = 1.38 \times 10^{-23}$ J/K; Avagadro number $N_A = 6.02 \times 10^{26}$/K mole.

Module-1

1 a. Give the theory of forced vibrations and obtain the expression for amplitude. **(08 Marks)**

b. With a neat diagram, explain the construction and working of Reddy tube. Mention four applications of shock waves. **(08 Marks)**

c. Calculate the resonant frequency for a simple pendulum of length 1m. **(04 Marks)**

OR

2 a. Define force constant and mention its physical significance. Derive the expression for force constant for springs in series and parallel combination. **(08 Marks)**

b. Define simple harmonic motion. Derive the differential equation of motion for it using Hook's law. Mention the characteristics and examples of simple harmonic motion. **(08 Marks)**

c. The distance between the two pressure sensors in a shock tube is 150mm. The time taken by a shock wave to travel this distance is 0.3ms. If the velocity of sound under the same condition is 340m/s. Find the Mach number of the shock wave. **(04 Marks)**

Module-2

3 a. Explain longitudinal stress, longitudinal strain, volume stress and volume strain. Discuss the effect of stress, temperature, annealing and impurities on elasticity. **(08 Marks)**

b. Derive the relation between bulk modulus(k), Young's modulus (Y) and Poisson's ratio (σ), what are the limiting values of Poisson's ratio? **(08 Marks)**

c. Calculate the extension produced in a wire of length 2m and radius 0.013×10^{-2}m due to a force of 14.7 Newton applied along its length. Given, Young's modulus of the material of the wire $Y = 2.1 \times 10^{11}$N/m^2. **(04 Marks)**

OR

4 a. Describe a single cantilever and derive the expression for Young's modulus of the material of rectangular beam. **(08 Marks)**

b. Derive an expression for couple per unit twist for a solid cylinder with a diagram. **(08 Marks)**

c. Calculate the angular twist of a wire of length 0.3m and radius 0.2×10^{-3}m when a torque of 5×10^{-4} Nm is applied. (Rigidity modulus of the martial is 8×10^{10} N/m^2). **(04 Marks)**

Module-3

5 a. Explain Divergence and curl. Derive Gauss Divergence theorem. **(08 Marks)**

b. Define V-number and fractional index change. With a neat diagrams, explain different types of optical fibers. **(08 Marks)**

c. Find the divergence of the vector field $\vec{A}$ given by $\vec{A} = 6x^2\hat{a}_x + 3xy^2\hat{a}_y + xyz^3\hat{a}_z$ at a point P(1, 3, 6). **(04 Marks)**

OR

6 a. Derive the expression for displacement current. Mention 4 Maxwell's equations in differential form for time varying fields. **(08 Marks)**

b. Derive an expression for numerical aperture in an optical fiber and stain the condition for propagation. **(08 Marks)**

c. Find the attenuation in an optical fiber of length 500m When a light signal of power 100mw emerges out of the fiber with a power 90mw. **(04 Marks)**

Module-4

7 a. State and explain Heisenberg's Uncertainty Principle. Show that the electron cannot exist inside the nucleus. **(08 Marks)**

b. Define spontaneous emission and stimulated emission. Explain the construction and working semiconductor Laser. **(08 Marks)**

c. A partied of mass $0.5mev/C^2$ has kinetic energy 100eV. Find its de Broglie wavelength, where C is the velocity of light. **(04 Marks)**

OR

8 a. Assuming the time independent Schrödinger wave equation, discuss the solution for a particle in one dimensional potential well of infinite height. Hence obtain the normalized wave function. **(08 Marks)**

b. Derive the expression for energy density interms Eienstein's co-efficient. **(08 Marks)**

c. The ratio of population of two energy levels is 1.059×10^{-30}. Find the wavelength of light emitted by spontaneous emissions at 330K. **(04 Marks)**

Module-5

9 a. Give the assumptions of quantum free electron theory. Discuss two success of quantum free electron theory. **(08 Marks)**

b. What are polar and non-polar dielectrics? Explain types of polarization. **(08 Marks)**

c. Calculate the probability of an electron occupying an energy level 0.02ev above the Fermi level at 200K and 400K in a material. **(04 Marks)**

OR

10 a. Define internal field. Mention the expressions for internal field, for one dimension, for three dimensional, and Lorentz field for dialectics. Derive Clausius – Morsotti equation. **(08 Marks)**

b. Describe Fermi level in an intrinsic semi conductor and hence obtain the expression for Fermi energy in terms of energy gap of intrinsic semiconductor. **(08 Marks)**

c. An elemental solid dielectric material has polarizability $7 \times 10^{-40} Fm^2$. Assuming the internal field to be Lorentz field, calculate the dielectric constant for the material if the material has 3×10^{28} atoms/m^3. **(04 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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15PHY12/22

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,*** $C = 3\times10^{8}$ ***m/S,***
Plank's constant $h = 6.625\times10^{-34}$ ***JS;***
Mass of electron $m_e = 9.11\times10^{-31}$ ***kg,***
Boltzmann constant $K = 1.38\times10^{-23}$ ***J/K,***
Avagadro number, $N_A = 6.02\times10^{26}$ ***/Kmole,***
Charge of electron $e = 1.6\times10^{-19}$ 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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CBCS SCHEME

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18CIV14/24

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State the scope of following fields of civil engineering. i) Geotechnical Engineering ii) Transportation Engineering iii) Water Resources and Irrigation Engineering iv) Structural Engineering. **(08 Marks)**

b. State and explain basic concepts of idealization of mechanics. **(04 Marks)**

c. Determine resultant force for the system shown in Fig.Q1(c). **(08 Marks)**

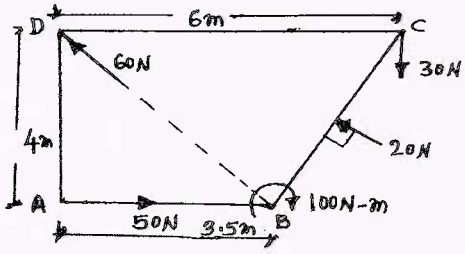

Fig.Q1(c)

OR

2 a. State and explain the effect of infrastructural facilities on social–economic development of a country. **(08 Marks)**

b. State : i) Principle of transmissibility ii) Resolution and composition of forces. **(04 Marks)**

c. Find the angle 'α' if resultant force of the system shown in Fig.Q2(c) is vertical, also find magnitude of resultant force. **(08 Marks)**

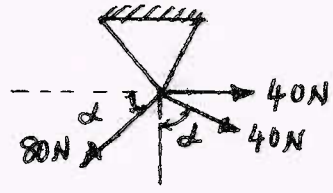

Fig.Q2(c)

Module-2

3 a. State and explain free body diagram with examples. **(04 Marks)**

b. Find tension in string if the system is in equilibrium shown in Fig.Q3(b). **(08 Marks)**

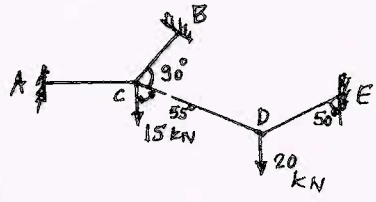

Fig.Q3(b)

c. A uniform ladder weight 850N and length 6m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with horizontal is 65°. When man of weight 700N stands on the ladder at a distance of 4m from the top of the ladder, the ladder slides right side. Determine the coefficient of friction between ladder and ground. **(08 Marks)**

OR

4 a. State laws of dry friction. **(04 Marks)**

b. Find contact pressure at surfaces of contact for the system shown Fig.Q4(b) for two identical cylinders P and Q. **(08 Marks)**

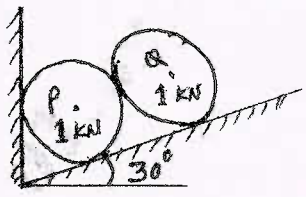

Fig.Q4(b)

c. A block weighing 3kN overlying a 10° wedge on a horizontal floor and leaning against a vertical wall is to be raised by applying a horizontal force to the wedge. Angle of friction between wall and the block as 15° and for other surfaces of contact as 18°. Determine minimum horizontal force to be applied to rise the block shown in Fig.Q4(c). **(08 Marks)**

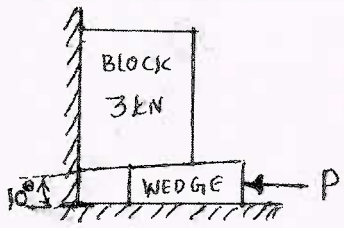

Fig.Q4(c)

Module-3

5 a. Distinguish between :

i) Statically determinate and indeterminate beams with examples

ii) Method of Joints and method of sections. **(06 Marks)**

b. State assumptions made in truss analysis. **(04 Marks)**

c. Find support reactions for the beam shown in Fig.Q5(c). **(10 Marks)**

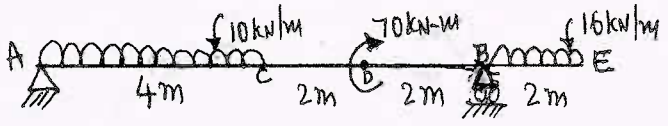

Fig.Q5(c)

OR

6 a. Define support and support reaction and explain different types of supports with neat sketches. **(06 Marks)**

b. Find support reactions for cantilever beams shown in Fig.Q6(b). **(04 Marks)**

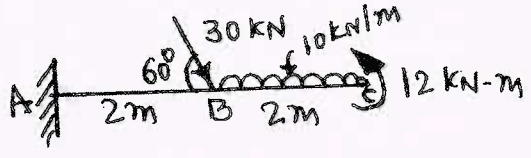

Fig.Q6(b)

c. Find forces in members of truss shown in Fig.Q6(c) using methods of joints and tabulate member forces. **(10 Marks)**

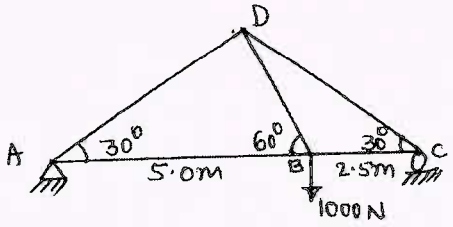

Fig.Q6(c)

Module-4

7 a. Determine second moment area of semicircle about horizontal diametrical axis. **(06 Marks)**

b. State and prove parallel axes theorem. **(04 Marks)**

c. Locate the Centriod of plane area shown in Fig.Q7(c). **(10 Marks)**

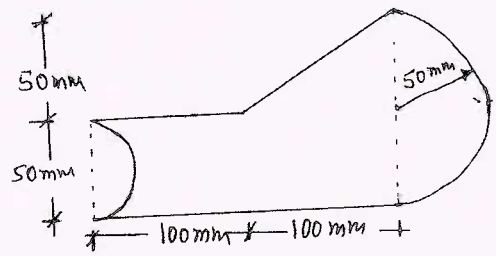

Fig.Q7(c)

OR

8 a. Determine the centriod of triangle of base 'B' and height 'H'. **(06 Marks)**

b. Define : i) Radius of gyration ii) Product of inertia
iii) Centriod iv) Centre of gravity. **(04 Marks)**

c. Find radius of gyration about X-X axis shown in Fig.Q8(c). **(10 Marks)**

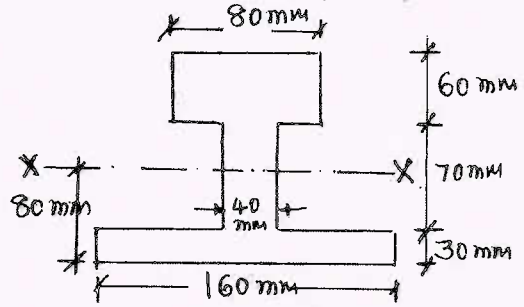

Fig.Q8(C)

Module-5

9 a. State and explain D'Alembert's principle. **(04 Marks)**

b. Define : i) Super elevation and state the importance of super elevation
ii) Displacement, acceleration and instantaneous velocity. **(06 Marks)**

c. A bullet fired upwards at an angle of 30° to the horizontal from top of hill of height 80m and bullet strikes the ground which is 80m lower than the point of projection. If Initial velocity of bullet is 100m/sec. Find :
i) Maximum height the bullet rise above the point of projection
ii) The velocity with which it strikes the ground
iii) Time of flight of bullet. **(10 Marks)**

OR

10 a. State Newton's laws of motion. **(04 Marks)**

b. A body falling freely under the action of gravity passes two points 20m apart vertically in 0.4 seconds. From what height above the higher point the body starts to fall take $g = 9.8m/sec^2$. **(08 Marks)**

c. A fly wheel rotating at 200rpm and after 10 seconds it rotating at 160rpm. If the retardation is uniform determine number of revolutions made and time taken by flywheel before it comes to rest from the speed of 200 rpm. **(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)**

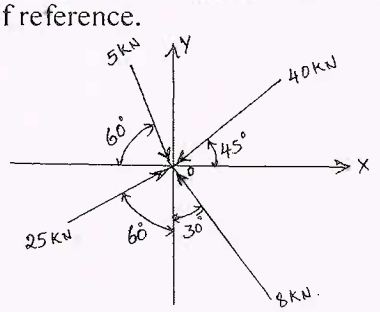

Fig.Q.2(c)

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)**

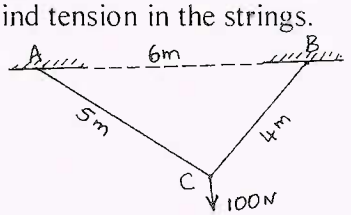

Fig.Q.3(b)

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)**

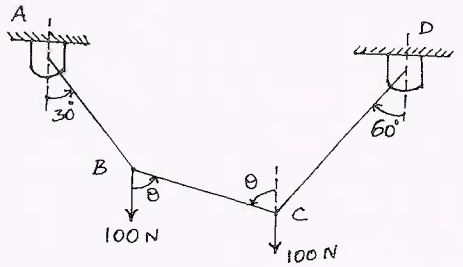

Fig.Q.4(c)

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)**

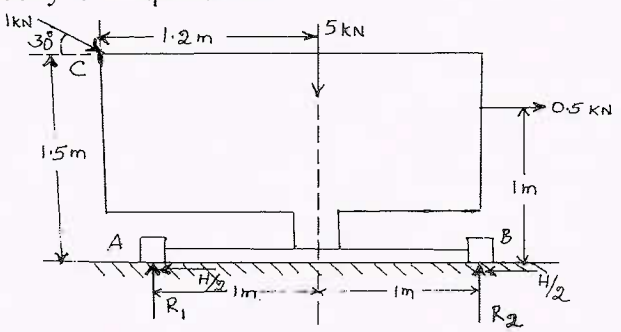

Fig.Q.5(b)

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)**

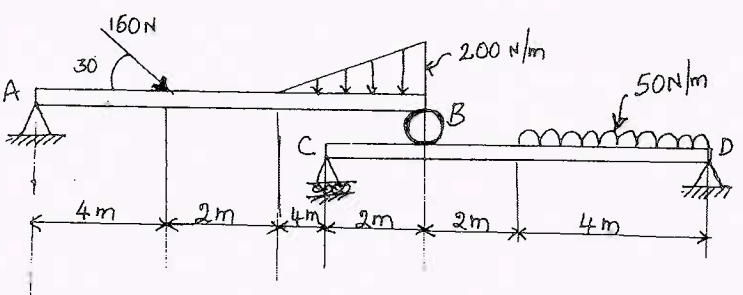

Fig.Q.6(b)

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)**

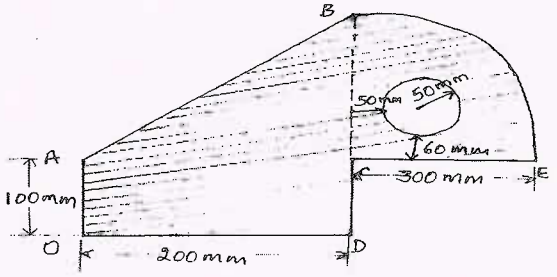

Fig.Q.7(c)

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)**

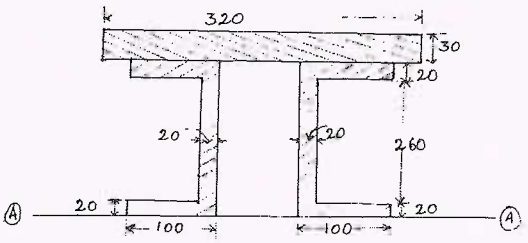

Fig.Q.8(b)

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

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15CIV13/23

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)**

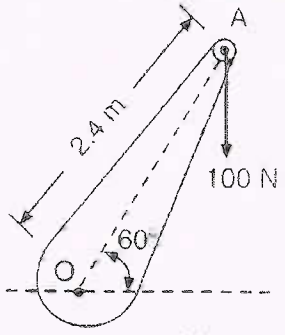


Fig.Q.1(c)

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)**

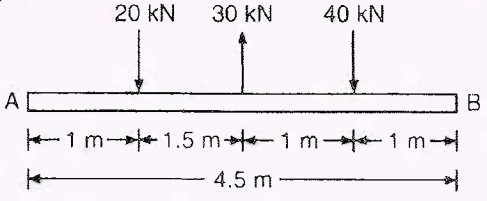


Fig.Q.2(a)

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)**

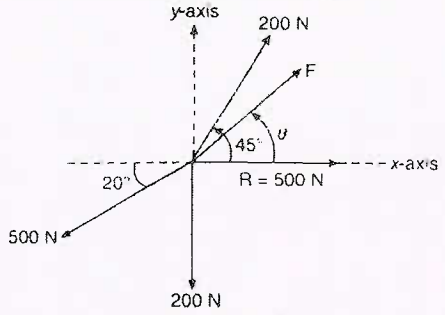


Fig.Q.3(c)

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)**

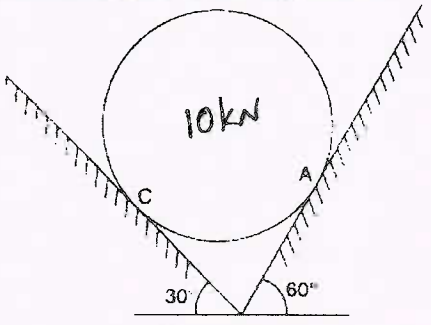


Fig.Q.4(b)

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)**

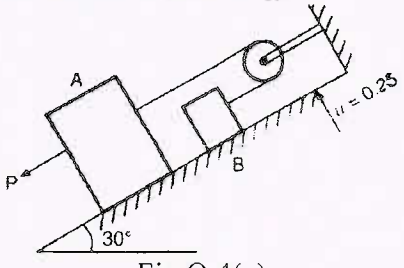


Fig.Q.4(c)

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)**

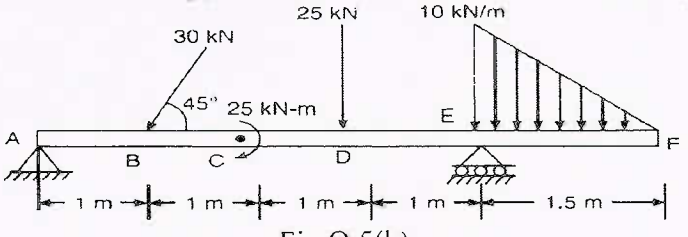


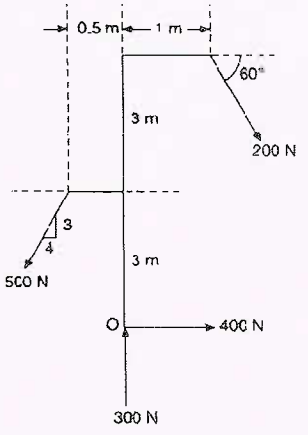
Fig.Q.5(b)

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)**

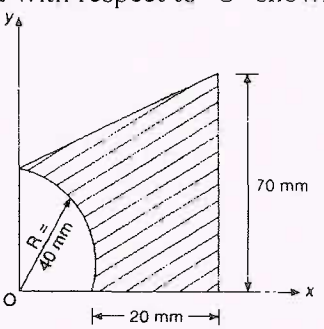
b. Compute the Radii of gyration about its centroidal axes Fig.Q.7(b). **(10 Marks)**

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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CBCS SCHEME

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18ME15/25

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. Distinguish between conventional and non-conventional sources of energy. **(08 Marks)**

b. With neat sketch, explain principle of working of Hydrostatic power plant. **(08 Marks)**

c. State and explain the Zeroth law of thermodynamics. **(04 Marks)**

OR

2 a. Distinguish between: i) Open System and closed system ii) Heat and work **(06 Marks)**

b. Define: i) Sensible heat ii) Latent heat iii) Dryness fraction iv) Wet steam. **(08 Marks)**

c. Find the specific volume and enthalpy of 1kg of steam at 0.8MPa. i) When the dryness fraction is 0.9 ii) When the steam is superheated to a temperature of 300°C. The specific heat of superheated steam is 2.25kJ/kg K. **(06 Marks)**

Module-2

3 a. Explain with a neat sketch, the working of Babcock and Wilcox boiler. **(12 Marks)**

b. Write a brief note on:
i) Priming of pumps
ii) Cavitation in pumps. **(08 Marks)**

OR

4 a. List and explain in brief, the boiler mountings and accessories. **(10 Marks)**

b. Sketch and explain the working of Pelton wheel. **(10 Marks)**

Module-3

5 a. With help of PV diagram, explain the working of four stroke petrol engine. **(08 Marks)**

b. Mention the advantages of two stroke engine over four stroke engine. **(06 Marks)**

c. List the desirable properties of an ideal refrigerant. **(06 Marks)**

OR

6 a. With neat sketch explain the working principle of vapour absorption refrigeration system. **(08 Marks)**

b. Calculate the brake power of a single cylinder four stroke petrol engine which is running at a speed of 400rpm. The load on the brake drum is 24kg and the spring balance reads 4kg. The diameter of the brake drum is 600mm and the rope diameter is 30mm. **(06 Marks)**

c. Define: i) Refrigeration ii) COP iii) Ton of refrigeration. **(06 Marks)**

Module-4

7 a. Differentiate between ferrous and non ferrous metals. **(06 Marks)**

b. What is a composite? How are composite materials classified? List the applications of composite materials. **(08 Marks)**

c. Distinguish between soldering, brazing and welding. **(06 Marks)**

OR

8 a. Describe the principle of arc welding with suitable welding circuit diagram. **(08 Marks)**

b. What are the advantages and disadvantages of gear drive? **(06 Marks)**

c. Define slip with reference to belt drive. Why it occurs explain the phenomenon of creep in belt drives. **(06 Marks)**

Module-5

9 a. Draw a neat sketch of engine lathe and label the parts. **(10 Marks)**

b. Explain the following with sketches:

i) Up milling

ii) Down milling

iii) Face milling. **(10 Marks)**

OR

10 a. Define a robot and list the classification of robot based on physical configuration. **(08 Marks)**

b. List and explain various components of CNC. What are the advantages and disadvantages of CNC? **(12 Marks)**

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14EME14/24

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

Time: 3 hrs. Max. Marks:100

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

Module – 1

1 a. What do you mean by renewable energy resources? Explain the following (i) Solar energy (ii) Hydroelectric energy (iii) Wind energy. **(08 Marks)**

b. Explain solar thermal energy harvesting through liquid flat plate collector with the help of neat sketch. **(06 Marks)**

c. Explain the functions of following boiler accessories (i) Economiser (ii) Super heater (iii) Air pre heater (iv) Steam separator **(06 Marks)**

2 a. Explain the working of Lancashire Boiler with the help of a neat sketch. **(10 Marks)**

b. What do you mean by specific enthalpy of wet steam, specific enthalpy of dry saturated steam, specific volume of wet steam, specific volume of dry saturated steam and internal energy of wet steam? **(10 Marks)**

Module – 2

3 a. Explain the principle of operation of De Laval Turbine with the help of neat sketch. How do pressure-velocity changes take place in impulse turbine? Explain with the help of figure. **(10 Marks)**

b. Explain working of Francis turbine with the help of neat sketch. **(06 Marks)**

c. What do you mean by the following terms with regard to I.C. Engines?
(i) Stroke (ii) Bore (iii) Top dead centre (iv) Bottom dead centre. **(04 Marks)**

4 a. Explain the principle of operation of closed cycle gas turbine with the help of neat sketch. **(06 Marks)**

b. With the help of PV diagram, explain the working of a four-stroke petrol engine. **(06 Marks)**

c. A single cylinder 4-stroke diesel engine develops indicated power of 30 kW at 300 rpm. The indicated mean effective pressure is 6.5 bar. The piston speed is 180 m/min. Determine the stroke and diameter of the cylinder. Also find the specific fuel consumption on brake power basis, if the mechanical efficiency is 80% and the indicated thermal efficiency is 30%. Take calorific value of diesel as 40 MJ/kg. **(08 Marks)**

Module – 3

5 a. Explain turning and facing operation with the help of neat sketch. **(06 Marks)**

b. Explain End milling and slot milling operations with the help of neat sketch. **(06 Marks)**

c. Define automation. What do you mean by programmable and flexible automation? Explain. **(08 Marks)**

6 a. What do you mean by the following operations? Explain with the help of neat sketch:
(i) Boring (ii) Reaming (iii) Tapping (iv) Counter sinking **(08 Marks)**

b. Explain cylindrical and Cartesian coordinate of figuration of robots. **(06 Marks)**

c. Explain the functions of different elements of NC system with the help of block diagram. **(06 Marks)**

Module – 4

7 a. Write properties and applications of following cast iron,
(i) Gray cast iron (ii) White cast iron (iii) Malleable cast iron
(iv) Nodular cast iron **(08 Marks)**

b. What is soldering? What are the steps of soldering process? Explain. **(06 Marks)**

c. What do you mean by Neutral flame, oxidizing flame and reducing flame in Gas Welding? Explain with the help of neat sketch. **(06 Marks)**

8 a. What is composite material? What do you mean by "Matrix Material" and "Reinforcement material structure" used in classification of composite materials? Explain. **(06 Marks)**

b. Write the difference between soldering and brazing operations. What are the advantages of brazing operation? **(06 Marks)**

c. Explain principle of operation of arc welding process. With the help of neat sketch, what are the advantages of coating of electrode in arc welding process? **(08 Marks)**

Module – 5

9 a. Explain the basic concept of principle of refrigeration. What do you mean by refrigerant? **(06 Marks)**

b. Define the following:
(i) Refrigerating effect (ii) Ton of refrigeration (iii) Ice making capacity
(iv) Coefficient of performance (v) Relative COP (vi) Latent heat of evaporation **(06 Marks)**

c. Explain the working of vapour absorption refrigerator with the help of neat sketch. **(08 Marks)**

10 a. What are the different parts of a refrigerator? Explain their functions. **(06 Marks)**

b. Explain the working of vapour compression refrigerator with the help of neat sketch. **(08 Marks)**

c. Define the following:
(i) Absolute humidity (ii) Relative humidity (iii) Discomfort index
(iv) Specific humidity **(06 Marks)**

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18ELE13/23

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 Ohm's Law. Mention its limitations. **(06 Marks)**

b. Find E_1, E_2 and I when the power dissipated in the 5Ω resistor is 125W.(Ref. Fig.Q1(b)). **(07 Marks)**

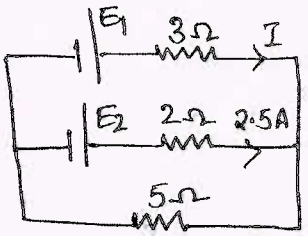

Fig.Q1(b)

c. Define RMS value of alternating current, show that its value is proportional to maximum value. **(07 Marks)**

OR

2 a. Two 12V batteries with internal resistances 0.2Ω and 0.25Ω respectively are joined in parallel and a resistance of 1Ω is placed across the terminals. Find the current supplied by each battery. **(07 Marks)**

b. The equation for an AC voltage is given as V = 0.04sin (2000t + 60°)V. Determine the frequency, the angular frequency, instantaneous voltage when t = 160μs. What is the time represented by a 60° phase angle. **(06 Marks)**

c. Explain the generation of 1ϕ AC induced emf with suitable diagram. **(07 Marks)**

Module-2

3 a. Show that in a pure inductor the current lags behind the voltage by 90°. Also draw the voltage and current waveforms. **(06 Marks)**

b. Given V = 200 sin 377 volts and i = 8 sin (377t – 30°)Amps for an AC circuit, determine : i) Power factor ii) True power iii) Apparent power iv) Reactive power indicate the unit of power calculated. **(08 Marks)**

c. 3 similar coils each having resistance of 10Ω and reactance of 8Ω are connected in star across 400V, 3ϕ supply. Determine : i) Line current ii) Total power iii) Reading of each of the two wattmeters connected to measure power. **(06 Marks)**

OR

4 a. Show that the power in a balanced 3ϕ star connected circuit can be measured by 2 Wattmeter. Draw the circuit and vector diagram. **(08 Marks)**

b. Three coils each of impedance $20\angle 60°\Omega$ are connected in star to 3ϕ 400V, 50Hz supply. Find the reading on each of the 2 wattmeters connected to measure the power input. **(08 Marks)**

c. What is meant by power factor in AC circuits? What is its significance in AC circuits? **(04 Marks)**

Module-3

5 a. Derive an emf equation of transformer with usual notation. **(06 Marks)**

b. Explain the 2 way control and 3 way control of lamp with suitable circuit diagram and working table. **(06 Marks)**

c. A 40KVA, 1ϕ transformer has core loss of 450W and full load copper loss 850Watts. If the power factor of the load is 0.8. Calculate :
   i) Full load efficiency
   ii) Maximum efficiency at UPF
   iii) Load for maximum efficiency. **(08 Marks)**

OR

6 a. List different types of loss in a transformer and explain each one in brief. **(06 Marks)**

b. What is Earthing? Why earthing is required? With the help of sketch explain plate earting. **(08 Marks)**

c. Write a short note :
   i) MCB
   ii) Precautions agains electric shock. **(06 Marks)**

Module-4

7 a. With a neat sketch, explain the construction of the various parts of DC generator. **(08 Marks)**

b. Explain the significance of back emf in a DC motor. **(06 Marks)**

c. A shunt wound DC generator delivers 496A at 440V to load. The resistance of the shunt field coil is 110Ω and that of armature winding is 0.02Ω. Calculate the emf induced in the armature. **(06 Marks)**

OR

8 a. Derive the torque equation of DC motor with usual notations. **(06 Marks)**

b. A 6 pole lap-connected DC series motor, with 864 conductors, takes a current of 110A at 480V. The armature resistance and the series field resistance are 0.18Ω and 0.02Ω respectively. The flux per pole is 50mwb. Calculate :
   i) The speed ii) The gross torque. **(07 Marks)**

c. Derive emf equation of a DC generator. **(07 Marks)**

Module-5

9 a. Derive the emf equation of synchronous generator. **(06 Marks)**

b. With a circuit diagram, explain the working of star-delta starter for a 3ϕ induction motor. **(07 Marks)**

c. A 12 pole, 3ϕ alternator is coupled to an engine running at 500rpm. It supplies an induction motor which has a full load speed of1440rpm. Find the percentage slip and the number of poles of the motor. **(07 Marks)**

OR

10 a. Explain the concept of rotating magnetic field and show that resultant flux remains same at different instants of time. **(07 Marks)**

b. A 3ϕ, 50Hz, 20pole, salient pole alternator with Y-connected stator winding has 180 slots on the stator. There are 8 conductors per slot and the coils are full-pitched. The flues per pole is 25mwb. Assuming sinusoidally distributed flux, calculate :
   i) Speed ii) Generated emf per phase iii) Line emf. **(07 Marks)**

c. Describe the constructional features of synchronous generator with suitable diagram. **(06 Marks**

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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)**

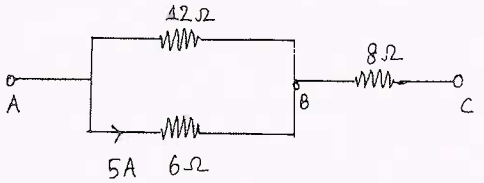

Fig.Q1(c)

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)**

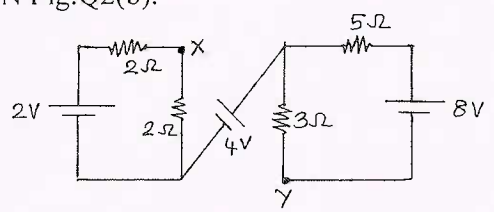

Fig.Q2(b)

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)**

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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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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14ELE15/25

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, selecting at least ONE question from each part.***

Module-1

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

b. Derive an expression for the energy stored in a magnetic field. **(06 Marks)**

c. Two coupled coils of self inductances 0.8H and 0.2H, have a co-efficient of coupling 0.9. Find the mutual inductance and turns ratio. **(08 Marks)**

2 a. State and explain :
i) Fleming's left hand rule ii)Faraday's second law of electro-magnetic induction. **(06 Marks)**

b. The total power consumed by the network shown in Fig.2(b) is 16W. Find the value of 'R' and total current. **(06 Marks)**

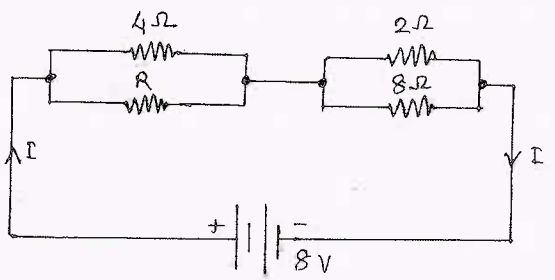

Fig.2(b)

c. In the circuit shown in Fig.2(c), find the voltage across A and B if i) switch 'S' is opened ii) Switch 'S' is closed.

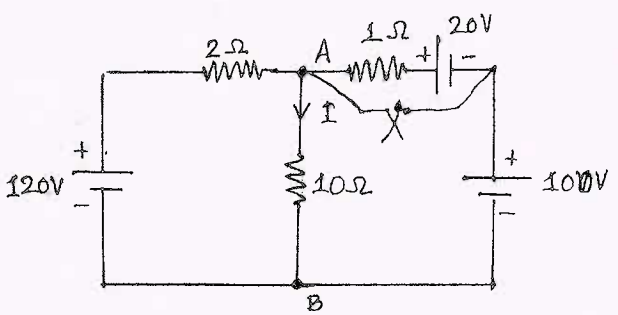

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Draw the cross sectional view of a DC machine with parts, mention the functions of following : i) Yoke ii) Field winding iii) Pole shoe iv) Commutator. **(06 Marks)**

b. Explain with a neat diagram, the constructional features and operation of an induction type single phase energy meter. **(08 Marks)**

c. A 4 pole, 100V DC shunt generator with lap connected armature, having field and armature resistance of 50Ω and 0.1Ω respectively, supplies sixty, 100V, 40W lamps. Calculate the total armature current, current per path and generated emf. Allow a contact drop of 1 volt per brush. **(06 Marks)**

4 a. Derive an EMF equation of DC generator. **(06 Marks)**

b. Explain with a neat diagram working principle of dynamometer type wattmeter. **(06 Marks)**

c. A 200V, lap wound, DC shunt motor has 800 conductors on its armature. The resistance of the armature winding is 0.5Ω and that of shunt field winding is 200Ω. The motor takes a current of 21A, the flux per pole is 30mwb. Find the speed and gross torque developed in the motor. **(08 Marks)**

Module-3

5 a. What is meant by power factor in an AC circuits? What is its significance in AC circuits? **(04 Marks)**

b. Show that current 'i' lags 90° to the applied voltage 'v' for pure inductance AC circuit. **(04 Marks)**

c. Explain 2-way control and 3-way control of lamp with suitable circuit diagram. **(06 Marks)**

d. A current $i = \sin(31t + 10°)$ produces a potential drop $v = 220\sin(31t + 20°)$ in a circuit. Find the values of circuit parameters, assuming a series combination. Assume $w = 31$rad/sec. **(06 Marks)**

6 a. Deduce a condition at which an RLC circuit behaves like a resistive circuit. **(06 Marks)**

b. Write a short note on :
i) Need of earthing ii) Earth leakage circuit breaker. **(08 Marks)**

c. Two impedances $Z_1 = 8 + j6\Omega$ and $Z_2 = 3 - j4\Omega$ are connected in parallel across 230V, 50Hz, AC supply. Calculate : i) line current ii) branch currents. **(06 Marks)**

Module-4

7 a. Explain the advantages of rotating field type 3 phase alternator. **(06 Marks)**

b. Two wattmeters are connected to measure power input to a 3 phase balanced circuit indicates 8 KW and 0.8KW, the later reading being obtained after reversing the current coil connection. Find : i) P.F of load ii) Active power. **(06 Marks)**

c. A 6 pole, 3 phase, 50Hz alternator has 12 slots per pole and 4 conductors per slot A flux of 25 mWb is sinusoidally distributed along the air-gap. Determine the line emf. If the alternator is star connected. Assume winding factor kd = 0.96, pitch factor, kp = 1. **(08 Marks)**

8 a. Explain the terms with reference to 3 phase AC system :
i) Balanced supply ii) Balanced load iii) Phase sequence
iv) Star connection v) delta connection vi) 3 phase, 4 wire system. **(06 Marks)**

b. Explain the construction of salient pole type rotor with neat diagram. **(06 Marks)**

c. Show that in a 3 phase star connected system the line voltage is $\sqrt{3}$ times the phase voltage with suitable circuit diagram and vector diagrams. **(08 Marks)**

Module-5

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

b. If a 6 pole induction motor supplied form a 3 phase, 50Hz, AC supply has a rotor frequency of 2.3Hz. Calculate : i) percentage slip ii) speed of motor. **(06 Marks)**

c. Define the voltage regulation, efficiency of transformer and obtain the condition for maximum efficiency. **(08 Marks)**

10 a. Explain the working principle of 3 phase induction motor. **(06 Marks)**

b. In a 25 KVA, 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. **(06 Marks)**

c. Explain the working of Y-Δ starter with neat diagram. **(08 Marks)**

CBCS SCHEME

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18PHY12/22

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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 : $h = 6.62 \times 10^{-34}$ JS ; $C = 3 \times 10^{8}$ m/s ; $K = 1.38 \times 10^{-23}$ J/K ; $N_A = 6.02 \times 10^{26}$/K mole ; $M_e = 9.1 \times 10^{-31}$ kg ; $e = 1.6 \times 10^{-19}$ C ; $g = 9.8$ m/s ; $\mu_O = 4\pi \times 10^{-7}$ H/m ; $\in_O = 8.852 \times 10^{-12}$ F/m.***

Module-1

1 a. Discuss the theory of forced oscillations and obtain an expression for Amplitude resonance. **(10 Marks)**

b. Define shock waves and mention the applications of shock waves. **(06 Marks)**

c. The distance between the two pressure sensors in a shock tube is 150mm. The time taken by a shock wave to travel this distance is 0.3ms. If the velocity of second is 340m/s under the same condition , find the Mach number of the shock wave. **(04 Marks)**

OR

2 a. What is Mach Number? Classify shock waves on the basis of Mach number and mention examples for each. **(06 Marks)**

b. Derive the expression for equivalent force constant for two springs in series and parallel. What is the period of its oscillations? **(10 Marks)**

c. A 20g oscillator with natural frequency 10 rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibrator. If the damping coefficient is 0.17, how does the oscillations decays. **(04 Marks)**

Module-2

3 a. Explain stress and strain diagram. **(06 Marks)**

b. Derive an expression for couple per unit twist of a solid cylinder. **(10 Marks)**

c. A load of 2kg produces an extension of 1mm in a wire of 3m in length and 1mm in diameter. Calculate the Young's modulus of the wire. **(04 Marks)**

OR

4 a. Show that shear strain (θ) is equivalent to half of compression strain ($\theta/2$) and half of extension strain ($\theta/2$) in two mutually perpendicular directions. **(06 Marks)**

b. Derive an expression for Young's modulus (Y) using Single Cantilever method. **(10 Marks)**

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

Module-3

5 a. By using Maxwells equations develop wave equation for electric and magnetic fields in free space. **(10 Marks)**

b. Explain with neat diagram the different types of optical fibre. **(06 Marks)**

c. An optical fibre has core RI 1.5 and RI of cladding is 1.455. Calculate numerical aperture and angle of acceptance. **(04 Marks)**

OR

6 a. Obtain the expression for Numerical Aperture and angle of acceptance and hence show the condition for propagation. **(08 Marks)**

b. State and prove Gauss divergence theorem. **(08 Marks)**

c. Find attenuation in an optical fibre of length 500m when a length of power 100mw emerges out of the fiber with a power 90mw. **(04 Marks)**

Module-4

7 a. State Heisenberg's uncertainty principle. Show that electron do not exists inside the nucleus using it. **(08 Marks)**

b. With neat diagram, explain the construction and working of CO_2 laser. **(08 Marks)**

c. An electron is trapped in a one – dimensional potential well of infinite height and a width of 0.2nm. Calculate the energy required for ground state and its first two excited states. **(04 Marks)**

OR

8 a. Derive an expression for energy density in terms of Einsteins co-efficients. **(10 Marks)**

b. Obtain energy eigen values for a particle in a potential well of infinite height. **(06 Marks)**

c. The uncertainty in the measurement of time spent by Iridium – 199 nuclei in the excited state is found to be 1.4×10^{-10} sec. Estimate the uncertainty in energy in the excited state. **(04 Marks)**

Module-5

9 a. Explain Hall effect. Derive an expression for Hall voltage, Hall field and Hall co-efficient. **(10 Marks)**

b. Define Fermi factor. Explain the variation of Fermi factor with temperature. **(06 Marks)**

c. The intrinsic carrier concentration of Germanium is $2.4 \times 10^{19}/m^3$. Calculate its conductivity if the mobility of the electron and holes respectively are $0.39 m^2/VS$ and $0.19 m^2/V\text{-}S$. **(04 Marks)**

OR

10 a. Derive Clausius – Morsotti relation in a solid dielectric. **(08 Marks)**

b. Explain any two failures of classical free electron theory and any two merits of quantum free electron theory. **(08 Marks)**

c. Calculate the concentration at which donor atoms need to be added to a silicon semiconductor, so that it results in n-type semi conductivity of 2.2×10^{-4} S/m and the mobility of electron being $1.25 \times 10^{-3} m^2/VS$. **(04 Marks)**

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CBCS SCHEME

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17PHY12/22

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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 :*** $h = 6.624\times10^{-34}$ *JS*, $m_e = 9.1\times10^{-31}$ *kg*. $K = 1.38\times10^{-23}\ J/K^{-1}$, $N_A = 6.023\times10^{23}$ / mole.

Module-1

1 a. Mention assumptions of Planck's radiation law. Show that Planck's law reduces to Wein's law and Rayleigh Jeans law at shorter and longer wavelength limits. **(06 Marks)**

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

c. Explain the energy distribution in the spectrum of a black body. **(04 Marks)**

d. Find group velocity and phase velocity of an electron with de Broglie wavelength 0.2nm. **(04 Marks)**

OR

2 a. State Heisenberg's Uncertainty Principle. Show that electron does not exist inside the nucleus. **(06 Marks)**

b. Define Phase Velocity and group velocity. Derive the relation between phase velocity and group velocity. **(06 Marks)**

c. Discuss Probability density for a particle in one dimensional potential well of infinite height for Ground and First excited states. **(04 Marks)**

d. An electron has a speed of $4.8 \times 10^5\ ms^{-1}$ accurate to 0.012%. With what accuracy can be located the position of electron? **(04 Marks)**

Module-2

3 a. Elucidate the difference between classical free Electron theory and Quantum Free Electron theory. **(06 Marks)**

b. Describe how BCS theory explains superconductivity. **(06 Marks)**

c. Define Relaxation time , Mean free path , Drift velocity. **(04 Marks)**

d. The resistivity of intrinsic germanium at 27^0 C is equal to 0.47Ωm. Assuming electron and hole mobilities as 0.38 and 0.18 $m^2\ V^{-1}S^{-1}$ respectively. Calculate the intrinsic carrier density. **(04 Marks)**

OR

4 a. State the law of mass action and derive the expression for electrical conductivity of a semiconductor. **(06 Marks)**

b. Define Fermi Energy. Discuss the probability of occupation of various energy states by electron at T = O K and T ≥ O K on the basis of Fermi Factor. **(05 Marks)**

c. What is Meissner effect? Distinguish between Type I and Type II super conductors. **(05 Marks)**

d. Calculate the probability of electron occupying an energy level 0.02eV above the Fermi level at temperature 200K. **(04 Marks)**

Module-3

5 a. Describe construction and working of semiconductor laser, with neat diagrams. **(06 Marks)**

b. Discuss point to point optical fiber communication system. **(05 Marks)**

c. Mention the application of laser and write a note on measurement of pollutants in atmosphere using laser. **(05 Marks)**

d. The ratio of population of two energy levels is 8.82×10^{-31}. Find the wavelength of light emitted at ambient temperature 27^0C. **(04 Marks)**

OR

6 a. What is Numerical Aperture? Obtain an expression for Numerical Aperture in optical fibers. **(05 Marks)**

b. Derive an expression for energy density of radiation in terms of Einstein's co-efficient. **(06 Marks)**

c. What is Attenuation? Explain any two factors contributing to fiber losses. **(05 Marks)**

d. A fiber 5m long has an input power of 8.6mW and output power 7.5mW. What is the attenuation of the fiber? **(04 Marks)**

Module-4

7 a. What is Bravais Lattice? Derive an expression for interplanar distance in terms of Miller Indices for cubic lattice. **(06 Marks)**

b. Explain the crystal structure of diamond with a neat diagram and calculate its APF. **(06 Marks)**

c. Derive Bragg's law. **(04 Marks)**

d. Draw the crystal planes [0 0 1] [1 2 1] [1 $\bar{1}$ 0] & [1 0 2]. **(04 Marks)**

OR

8 a. Explain the seven crystal systems, with neat diagrams. **(07 Marks)**

b. Define Allotropy and Polymorphism, with examples. What is Perovskite cystal? **(05 Marks)**

c. Calculate the atomic packing factor for SC and BCC. **(04 Marks)**

d. An X ray beam of wavelength 0.7^0A undergoes first order Bragg's reflection from the plane [302] of cubic crystal at glancing angle 35^0, calculate the lattice constant. **(04 Marks)**

Module-5

9 a. What is Carbon nanotube? Explain how it is synthesized using Arc – Discharge method. **(06 Marks)**

b. Describe construction and working of Reddy shock tube, with neat diagram. **(07 Marks)**

c. Distinguish between Ultrasonic, Subsonic and Supersonic waves. **(03 Marks)**

d. In a scanning electron microscope, electrons are accelerated through a potential difference of 200KV. Estimate the wavelength of the electrons in the scanning beam. **(04 Marks)**

OR

10 a. Explain the principle construction and working of scanning electron microscope, with neat diagram. **(07 Marks)**

b. What is a Shock Wave? Briefly explain Rankine – Hugoniot shock equations. **(05 Marks)**

c. What are Nanomaterials? Explain with neat diagram Ball – Milling method of synthesis of nanomaterials. **(05 Marks)**

d. Mention any three applications of CNT. **(03 Marks)**

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CBCS SCHEME

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18CHE12/22

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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 Standard reduction potential and derive Nernst equation for single electrode potential. **(06 Marks)**

b. What is a Reference electrode? Explain the construction and working of a Calomel electrode. **(07 Marks)**

c. Define Cell Potential. Give the cell representation , cell reactions and calculate the potential of the cell consists of Li and Cu electrodes dipped in 0.1 M Li Cℓ and 0.5M $CuSO_4$ solutions at 25^0C. Given $E^0Li = -3.05V$ and $E^0Cu = 0.34V$. **(07 Marks)**

OR

2 a. Define Ion selective electrode. Explain the determination of pH using glass electrode. **(06 Marks)**

b. Derive an equation for potential of a concentration cell and calculate the potential of following cell at 25^0C. Ag/Ag NO_3 (0.005m) // Ag NO_3(0.5m)/Ag. **(07 Marks)**

c. Explain the construction and working of Li - ion cells. Mention its applications. **(07 Marks)**

Module-2

3 a. Briefly explain the effect of following factors on rate of corrosion :
i) The ratio of Anodic and Cathodic areas ii) Nature of corrosion product.
iii) pH of the medium. **(06 Marks)**

b. Define Corrosion of metals. Describe the electrochemical theory of rusting of iron. **(07 Marks)**

c. Define Electroless plating and explain electroless plating of copper. **(07 Marks)**

OR

4 a. Explain Electroplating of hard chromium and mention its applications. **(06 Marks)**

b. Discuss the following : i) Differential metal corrosion ii) Anodization of aluminum. **(07 Marks)**

c. Explain in brief : i) Sacrificial anode method ii) Decomposition potential. **(07 Marks)**

Module-3

5 a. Define Calorific value of a fuel and calculate the gross and net calorific value of a coal from the following data :
i) Mass of coal burnt = 0.85 gms.
ii) Water equivalent mass of copper calorimeter = 0.65kg.
iii) Mass of water taken in the copper calorimeter = 2.2kg.
iv) Rise in temperature of water = 3.0^0C.
v) Percentage of H_2 in the coal = 3.2.
vi) Latent heat of steam = 2457.76 kJ/kg. **(06 Marks)**

b. Define Fuel cell and explain the construction and working $CH_3OH - O_2$ fuel cell. **(07 Marks)**

c. Describe the preparation of solar grade silicon by Union carbide process. **(07 Marks)**

CBCS SCHEME

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17ELE15/25

First/Second Semester B.E. Degree Examination, Aug./Sept. 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. Two coils having 30 and 600 turns respectively are wound side by side on an iron circuit of section 100cm^2 and mean length 150cm

i) Estimate the mutual inductance between two coils, of the permeability of iron is 2000

ii) A current in the first coil grows steadily from zero to 10A in 0.01sec. Find the emf induced in the other coil. **(07 Marks)**

c. An 8 ohms resistor is in series with a parallel combination of two resistors 12 ohms and 6 ohms. If the current in the 6Ω resistor is 4A. Determine :

i) Total current ii) Total supply voltage iii) Total power dissipated in the circuit. **(07 Marks)**

OR

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

b. In the circuit shown in Fig.Q2(b). Find E_1, E_2 and I, when the power dissipated in the 5Ω resistor is 125W.

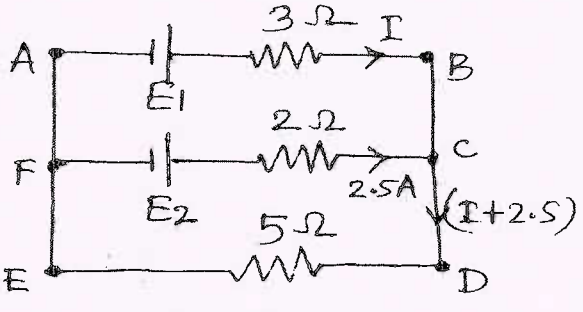

Fig.Q2(b) **(07 Marks)**

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

Module-2

3 a. Explain the function of following parts of DC machine i) Yoke ii) Field coil iii) Pole core iv) Pole shoe v) Commutator vi) Brush. **(06 Marks)**

b. Explain the construction and working principle of dynamometer type wattmeter. **(07 Marks)**

c. A 4 pole, 100V DC shunt generator with lap connected armature having field and armature resistance of 50Ω and 0.1Ω respectively, supplies sixty 100V, 40W lamps. Calculate :

i) Total armature current ii) Current per path iii) Generated EMF. **(07 Marks)**

OR

4 a. Define the Back EMF of a DC motor and explain its significance. **(06 Marks)**

b. Explain the basic working principle of a single phase induction type energy meter with a neat diagram. **(07 Marks)**

c. A 4 pole DC shunt motor takes 12A from 220V supply. The armature and field resistances are respectively 0.5Ω and 100Ω. The armature is lap connected with 300 conductors. If the flux per pole is 20mwb. Calculate : i) Speed ii) Gross torque. **(07 Marks)**

Module-3

5 a. Derive an expressions for : i) RMS value ii) Average value of sinusoidal AC current. **(06 Marks)**

b. Explain the 2 way control of lamp with a suitable circuit diagram and list its applications. **(07 Marks)**

c. A 318μF capacitor is connected across a 230 volts, 50Hz AC system. Determine :
i) Capacitive reactance ii) RMS value of current iii) Equations for voltage and current. **(07 Marks)**

OR

6 a. Obtain the voltage and current relations for R–L series AC circuit and show that power $P = VI \cos \phi$ watts. **(06 Marks)**

b. Explain the working of Residual Current Circuit Breaker (RCCB) with a suitable diagram. **(07 Marks)**

c. Two impedances $Z_1 = 2 + j3\Omega$ and $Z_2 = 2 - j4\Omega$ are connected in parallel, across a 100V, 50Hz AC supply calculate i) branch currents ii) total current of circuit. **(07 Marks)**

Module-4

7 a. Explain the generation of 3 phase AC system with suitable diagrams and waveforms. **(06 Marks)**

b. A 12 pole, 500RPM, star connected, 3 phase alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02wb and distributed sinusoidally. The winding factor is 0.97. Calculate : i) Frequency ii) Phase EMF iii) Line EMF. **(07 Marks)**

c. Show that two wattmeters are sufficient to measure three phase power and also estimation of power factor. **(07 Marks)**

OR

8 a. Explain the constructional features of salient pole type rotor with a neat diagram. **(06 Marks)**

b. Three coils each of impedance of $20\angle 60\Omega$ are connected in star to a 400V, 3phase, 50Hz AC supply. Find the readings on each of two wattmeters connected to measure the input power. **(07 Marks)**

c. Derive an EMF equation of a 3 phase alternator. **(07 Marks)**

Module-5

9 a. Explain different types of losses in transformer and their minimization techniques. **(06 Marks)**

b. Describe the working of STAR – DELTA starter for a 3 phase induction motor with suitable diagram. **(07 Marks)**

c. A 30 KVA single phase transformer has a core loss of 450w and full load copper loss of 850w. If the power factor of the load is 0.8. Calculate :
i) Full load efficiency
ii) Load for maximum efficiency
iii) Maximum efficiency at UPF. **(07 Marks)**

OR

10 a. Explain the basic working principle of a transformer and list the application of transformer. **(06 Marks)**

b. An 8 pole alternator runs at 750RPM and supplies power to a 4 pole induction motor, which runs at 1455RPM. What is the slip of the induction motor? **(07 Marks)**

c. Derive an EMF equation of a transformer with suitable notations. **(07 Marks)**

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CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, Aug./Step.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. Define : i) Electric current ii) Potential difference iii) Resistance iv) Self inductance v) Electric power. **(05 Marks)**

b. For the circuit shown in Fig.Q1(b), find the power dissipated in the 16 ohm resistor.

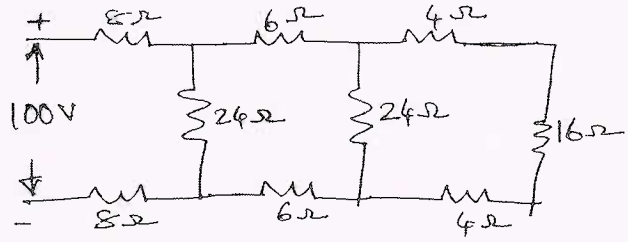

Fig.Q1(b) **(05 Marks)**

c. Find the inductance of a coil of 200 turns wound on a paper core tube of 25cm length and 5cm radius. Also calculate the energy stored in it if current rises from 0 to 5A. **(06 Marks)**

OR

2 a. Explain self induced emf and mutually inducted emf. Write the expressions for self inductance and mutual inductance. **(05 Marks)**

b. Two resistors are connected in parallel across a 200V supply and the total current drawn from the supply is 25A. If the power dissipated in one of the resistors is 1500w, what is the resistance of each resistor? **(06 Marks)**

c. Derive and expression for the energy stored in a magnetic field. **(05 Marks)**

Module-2

3 a. With usual notations derive the EMF equation of a DC generator. **(05 Marks)**

b. With a diagram, explain construction and working of single phase induction type energy meter. **(06 Marks)**

c. A 4 pole DC shunt motor takes 22A from 220V supply. The armature and field resistances are respectively 0.5Ω and 100Ω respectively and the armature is lap connected with 300 conductors. If the flux/pole is 20 mwb, calculate the speed and gross torque. **(05 Marks)**

OR

4 a. Draw : i) Ta Vs Ia ii) N Vs I_a characteristics of a dc series and shunt motors. Mention their applications. **(06 Marks)**

b. With a neat diagram, explain construction and principle of operation of dynamometer type wattmeter. **(05 Marks)**

c. A 4 pole, 220V, lap connected, DC shunt motor has 36 slots, each slot containing 16 conductors, it draws a current of 40A from the supply. $R_a = 0.1\Omega$; $R_{sh} = 110\Omega$, The motor develops an output power of 6kN. The flux/pole is 40 mwb. Calculate :
i) The speed ii) Armature torque iii) Shaft torque. **(05 Marks)**

Module-3

5 a. Prove that in a purely inductive circuit, the current lags the voltage by $\pi/2$ radius. **(05 Marks)**

b. Clearly differentiate between fuse and MCB. **(05 Marks)**

c. A parallel circuit comprise a 20Ω resistor in series with an inductive reactance of 15Ω in one branch and a 30Ω resistor in series with a capacitive reactance of 20Ω in the other branch. Determine the current and power dissipated in each branch if the total current drawn by the circuit is $10\angle -30°$ A. **(06 Marks)**

OR

6 a. Define : i) Wave form ii) Frequency iii) Amplitude iv) Form factor v) Peak factor. **(05 Marks)**

b. An AC current is given by c = 10 sin wt + 2 sin wt + 2 sin wt. Find the rms value of the current. **(05 Marks)**

c. What is the necessity of Earthing? Explain plat Earthing. **(06 Marks)**

Module-4

7 a. What is a polyphase system? List the advantages of the polyphase system over single phase system. **(05 Marks)**

b. Obtain an expression for the frequency of the induced emf in an alternator. **(05 Marks)**

c. A balanced 3ph, Y connected load draws power from 440V supply. The two wattmeters connected to measure the input power reads 5KW and 1.2KW respectively, the latter being obtained after reversing the current coil. Calculate : i) Total power ii) Power factor iii) Current in the circuit. **(06 Marks)**

OR

8 a. Draw the power triangle for the 3ϕ load obtain the relationship between phase and line values of current in a 3ph balanced delta connected system. **(06 Marks)**

b. A 3ph, 6pole, Y connected, AC generator rms at 1000rpm the stator has 90 slots and 8 conductors/slot the flux/pole is 0.05wb. Calculate the generated line voltage if the $K_w = 0.96$. **(05 Marks)**

c. There coils each of impedance $20\angle 60° \Omega$ are connected in Y across a 3ph, 400V, 50Hz supply. Find the readings on each of the two wattmeters connected to measure the input power. **(05 Marks)**

Module-5

9 a. Explain what happens when a transformer is connected to a DC supply. Compare core type and shell type transformers. **(05 Marks)**

b. The primary winding of a transformer is connected to a 240V, 50Hz supply. If the maximum value of the flux in the cone is 0.00207Wbs, determine :

i) Secondary induced emf

ii) Number of turns in the primary

iii) Cross sectional area of the cone if the maximum flux density in the core is 0.465 tesla. **(06 Marks)**

c. Explain the working principle of 3 phase induction motor. **(05 Marks)**

OR

10 a. A 600KVA transformer has an efficiency of 92% both at full load and half full load, upf. Calculate its efficiency at 75% full load, 0.9pf. **(06 Marks)**

b. Explain why an induction motor needs starter is the neat sketch, explain star-delta starter for a 3 phase induction motor. **(05 Marks)**

c. If a 6 pole induction motor supplied from a 3ph, 50Hz supply has a rotor frequency of 2.3Hz, calculate the percentage slip and the speed. **(05 Marks)**

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14ELE15/25

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State and explain the following terms:
(i) Independent Voltage Source
(ii) Electro Motive Force (EMF)
(iii) Kirchoff's Voltage Law (KVL) **(06 Marks)**

b. If the total power dissipated in the circuit shown in Fig.Q1(b) is 18 Watts, find the value of 'R' and its current.

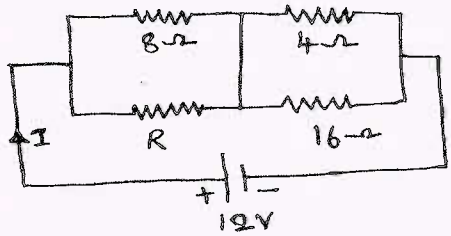

Fig.Q1(b) **(06 Marks)**

c. A coil of 2000 turns is wound uniformly over a non magnetic ring of mean circumference of 80 cm and cross sectional area of 0.6 sq.cm. If the current through the coil is 2A, calculate:
(i) Magnetizing force (ii) Reluctance (iii) Total flux (iv) Flux density **(08 Marks)**

2 a. Give the analogy between Electric and Magnetic circuits. **(06 Marks)**

b. Find the value of resistance 'R' as shown in Fig.Q2(b), so that current drawn from the source is 250 mA. All the resistor values are in ohm.

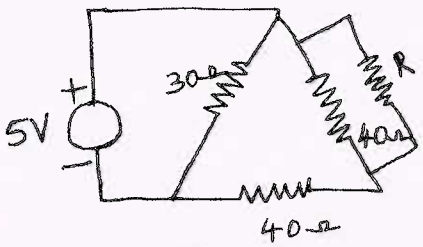

Fig.Q2(b) **(06 Marks)**

c. Two identical coils of 1200 turns each, are placed side by side such that, 60% of the flux produced by one coil links the other. A current of 10A in the first coil, sets up a flux of 0.12 mwb. If the current in the first coil changes from +10A to −10A in 20 m sec, find:
(i) the self inductance of the coils (ii) the emfs induced in both the coils. **(08 Marks)**

Module-2

3 a. With usual notations derive the e.m.f equation of a d.c. generator. **(06 Marks)**

b. With a neat schematic diagram, explain the constructional features and operation of an induction type single phase energy meter. **(06 Marks)**

c. A dc series generator has armature resistance of 0.5 Ω and series field resistance of 0.03 Ω. It drives a load of 50 A. If it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 rpm, calculate the terminal voltage at the load. Assume 4 poles, lap type winding, flux per pole as 2 mwb and total brush drop as 2V. **(08 Marks)**

4 a. What is back EMF in a dc motor? Explain its significance. **(06 Marks)**

b. With neat schematic diagram, explain the construction and working principle of dynamo meter type wattmeter. **(06 Marks)**

c. A 440 V dc shunt motor takes an armature current of 20 A and runs at 500 rpm. The armature resistance is 0.6 ohms. If the flux is reduced by 30% and the torque is increased by 40%. Calculate the new values of armature current and speed. **(08 Marks)**

Module-3

5 a. Obtain an expression for the current in the pure inductor if the voltage $v = v_m \sin \omega t$ is applied across. **(06 Marks)**

b. Write notes on: (i) Electric Fuse (ii) Electric shock **(06 Marks)**

c. An e.m.f. whose instaneous value is $100\sin\left(314t - \frac{\pi}{4}\right)$ Volts is applied to a circuit and the current flowing through it is $20\sin(314t - 1.5708)$ Amperes. Find the frequency and the values of circuit elements, assuming a series combination of circuit elements. **(08 Marks)**

6 a. With circuit connections, explain two way control of lamp. **(06 Marks)**

b. Deduce a condition at which an RLC circuit behaves like a resistive circuit. State whether the current in the circuit is minimum or maximum. **(06 Marks)**

c. Am alternating voltage of (160 + j120) Volts is applied to a circuit and the current is given by (6 + j8)A. Find the values of element of the circuit assuming 50 Hz frequency, power factor of the circuit and power consumed. **(08 Marks)**

Module-4

7 a. Discuss the advantages of three phase system. **(06 Marks)**

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

c. Power is measured in a three phase balanced load using two wattmeters. The line voltage is 400 V. The load and its power factor is so adjusted that the line current is always 10A. Find the reading of the wattmeters when the power factor is
(i) unity (ii) 0.866 (iii) 0.5 (iv) zero. **(08 Marks)**

8 a. Distinguish between salient and non-salient type of alternator rotors. **(06 Marks)**

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

c. A 3-phase, 6-pole, star-connected alternator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 wb (sinusoidally distributed). Calculate the voltage generated by the machine if the winding factor is 0.96 line and phase value. **(08 Marks)**

Module-5

9 a. Mention the types of transformers. With neat schematic diagram, explain the construction and working shell type transformer. **(06 Marks)**

b. Explain the various losses in a transformer and how to minimize them. On what factors they depend? Give the equations for these losses. **(06 Marks)**

c. A 600 KVA transformer has an efficiency of 92% at full load, unity power factor and at half load, 0.9 power factor. Determine its efficiency at 75% of full load and 0.9 power factor. **(08 Marks)**

10 a. Explain the working principle of three phase induction motor. **(06 Marks)**

b. If a six pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate: (i) The percentage slip (ii) The speed of the motor. **(06 Marks)**

c. With a neat circuit diagram, explain a star-delta starter for a three phase induction motor. **(08 Marks)**

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CBCS SCHEME

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18CIV14/24

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Element of Civil Engineering and Mechanics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain Briefly the scope of :
i) Construction Technology
ii) Environmental Engineering. **(08 Marks)**

b. Explain the role of civil engineer in the infrastructure development of the country. **(08 Marks)**

c. State and explain the low of transmissibility of forces. **(04 Marks)**

OR

2 a. State and prove Varignon's theorem of moments. **(08 Marks)**

b. Replace the horizontal force acting at A by an equivalent force acting at a B and a couple. Refer Fig.Q2(b).

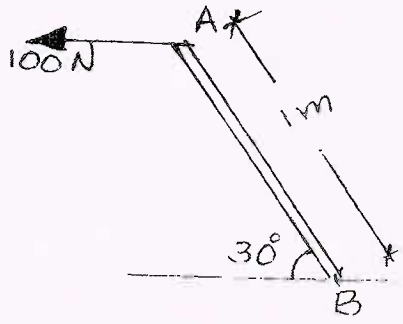

Fig.Q2(b) **(05 Marks)**

c. For the non-concurrent coplanar system shown in Fig.Q2(c), determine the magnitude, direction and position of the resultant force with reference to A.

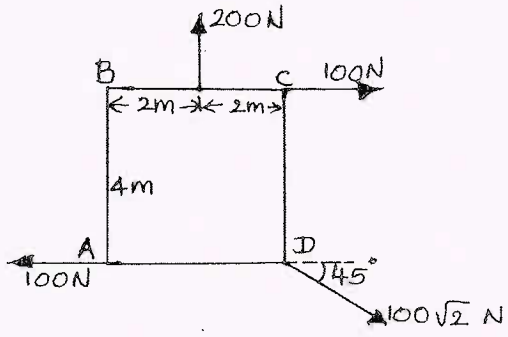

Fig.Q2(c) **(07 Marks)**

Module-2

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

b. Two identical rollers each weighing 200N are placed in a trough as shown in Fig.Q3(b), Assuming all contact surfaces to be smooth, find the reactions development at contact surfaces A, B, C and D.

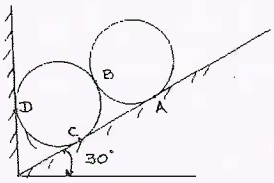

Fig.Q3(b) **(08 Marks)**

c. A string is subjected to the forces 4 kN and P as shown in Fig.Q3(c). Determine the magnitude of P and tension forces induced in various portions of the string.

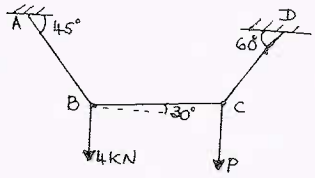

Fig.Q3(c) **(08 Marks)**

OR

4 a. State the laws of dry friction. **(04 Marks)**

b. A block of weight 1000N is resting on an inclined plane as shown in Fig.4(b). Find the magnitude of the horizontal force P to cause impending motion of the block :
i) Up the plane ii) Down the plane. Assume coefficient of friction = 0.25.

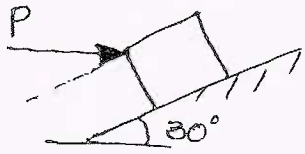

Fig.Q4(b) **(08 Marks)**

c. A ladder of length 5m and weighing 300N is placed against a vertical wall at an angle 60° with respect to the floor. The coefficient of friction between the wall and the ladder is 0.2 and that between the floor and the ladder 0.3. Calculate the minimum force (horizontal) P to be applied at the lower end of the ladder to prevent slipping when a man weighing 600N stands at a distance of 3m along the ladder from the bottom end. **(08 Marks)**

Module-3

5 a. Describe different types of supports with neat sketches showing the reactions. **(08 Marks)**

b. Find the support reactions for the beam shown in Fig.Q5(b).

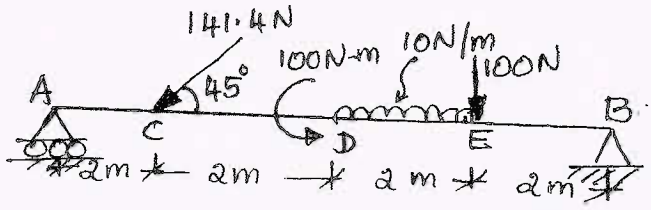

Fig.Q5(b) **(08 Marks)**

c. Find the reactions for the cantilever beam shown in Fig.Q5(c).

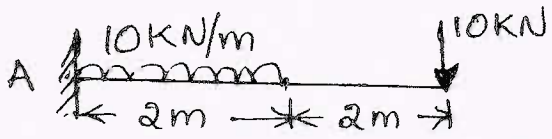

Fig.Q5(c) **(04 Marks)**

OR

6 a. Explain different types of trusses. **(06 Marks)**

b. Find the support reactions and member forces for the plane truss shown in Fig.6(b) by method of joints.

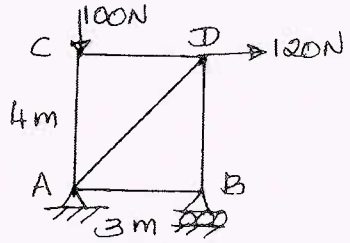

Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Derive the centroid of a triangle from first principle. **(08 Marks)**

b. Locate the centroid of the shaded area with respect to the coordinate axes shown in Fig.Q7(b).

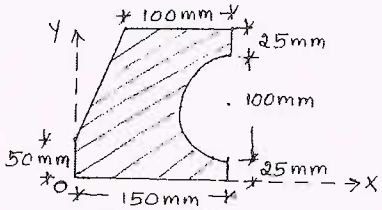

Fig.Q7(b) **(12 Marks)**

OR

8 a. State and prove parallel axis theorem. **(08 Marks)**

b. Find the polar moment of inertia for the section in Fig.Q8(b) and hence find the polar radius of gyration.

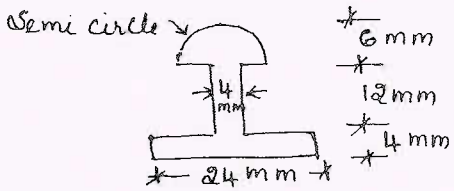

Fig.Q8(b) **(12 Marks)**

Module-5

9 a. State Newton's laws of motion. **(06 Marks)**

b. A car travels along a straight line on road. Its distance is given by the equation $S = 2.4t^2 - 0.12t^3$ where t is the time in seconds.

i) Calculate the average velocity of the car for the time interval at t = 0 and t = 15 sec.

ii) Calculate the instantaneous velocity of the car at t = 5sec

iii) Calculate the instantaneous acceleration of the car at t = 5 sec. **(14 Marks)**

OR

10 a. State D'Alembert's principle and its applications. **(04 Marks)**

b. Define : i) Super elevation ii) Trajectory. **(04 Marks)**

c. A ball is dropped from the top of a tower 30m high. At the same instant another ball is thrown upward from the ground with an initial velocity of 15m/s. When and where do they cross? **(12 Marks)**

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CBCS SCHEME

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17CIV13/23

First/Second Semester B.E. Degree Examination, Aug./Sept. 2020
Element of Civil Engineering and Engineering 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 the Impact of Infrastructural facilities on the Socio-economic development of a country. **(06 Marks)**

b. Define moment, couple and explain the characteristics of couple. **(07 Marks)**

c. Prepare the horizontal force 30N acting on the lever arm as shown in the Fig Q1(c) by an equivalent system. Consisting of a force and a couple at 'O'.

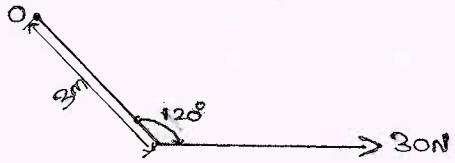

Fig Q1(c) **(07 Marks)**

OR

2 a. Explain the classification of Road system. **(06 Marks)**

b. With a neat figure, explain the 3 principles of engineering mechanics. **(07 Marks)**

c. Determine the moment at the point 'A' for the force system shown in the Fig Q2(c).

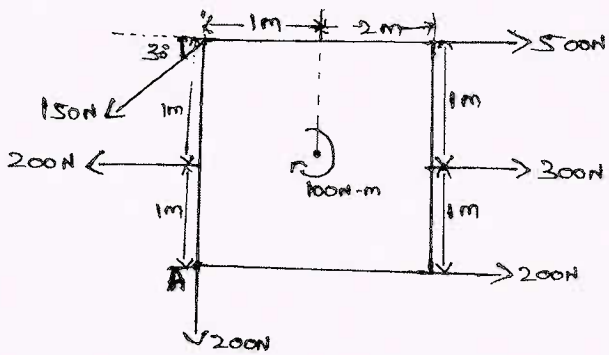

Fig Q2(c) **(07 Marks)**

Module-2

3 a. Define co-efficient of friction and angle of friction, show that angle of friction is equal to coefficient of friction. **(06 Marks)**

b. Determine the resultant of force system acing on a structure as shown in the Fig Q3(b) at A.

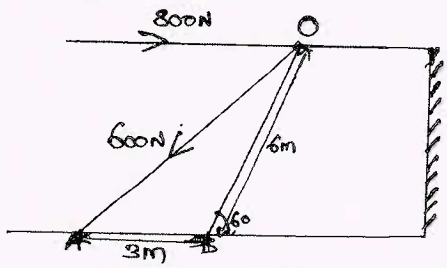

Fig Q3(b) **(08 Marks)**

c. The collar of weight 264.4N slides on a frictionless vertical rod and its connected to 294N counter weight. Determine the value of height 'H' for which system is in equilibrium as shown in Fig Q3(c).

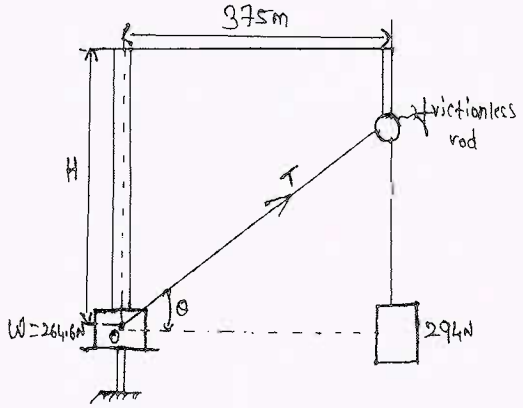

Fig Q3(c) **(06 Marks)**

OR

4 a. Define the following : i) Composition of forces ii) Equilibrium iii) Angle of Repose. **(06 Marks)**

b. A block of weight 5kN rest on a horizontal rough surface and the co-efficient of friction between them is 0.4. Show that the magnitude of force required to pull is less than magnitude of force required to push, if the angle made by both force pull and push is 30° with respect to horizontal. **(08 Marks)**

c. A block is pulled by 2 ropes as shown in Fig 4(c) if the resultant of the 2 forces is 5kN and directed along the axis of the block. Determine the tension in the each of the rope.

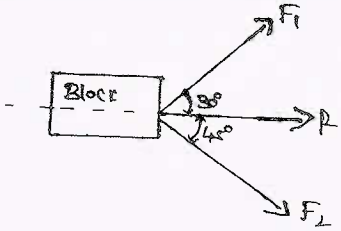

Fig Q4(c) **(06 Marks)**

Module-3

5 a. Determine the resultant and moment at the point 'A' for the system of forces acting on the square block of size 2m each as shown in the Fig Q5(a)

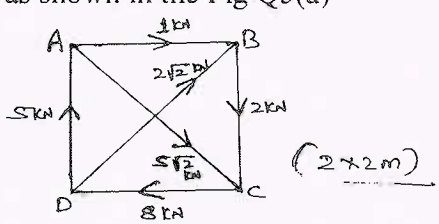

Fig Q5(a) **(08 Marks)**

b. Determine the support reaction of the overhanging Beam shown in the Fig Q5(b).

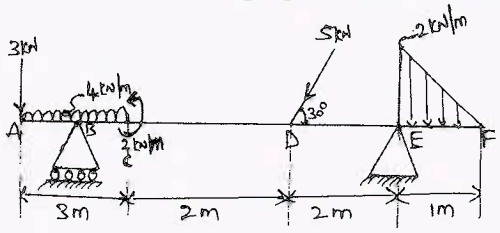

Fig Q5(b) **(08 Marks)**

c. With a neat figure, explain the different types of supports. **(04 Marks)**

OR

6 a. Assuming pulley to be smooth, calculate support reactions for Beam AC as shown in Fig Q6(a).

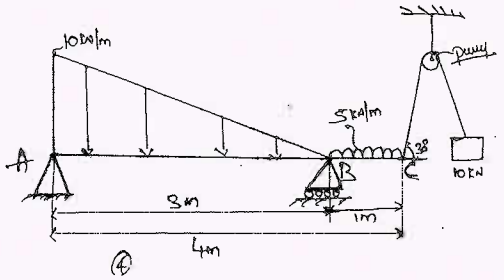

Fig Q6(a) **(10 Marks)**

b. Determine the magnitude, direction and point of application of resultant force for the system of forces shown in Fig Q6(b). With respect to point 'O'.

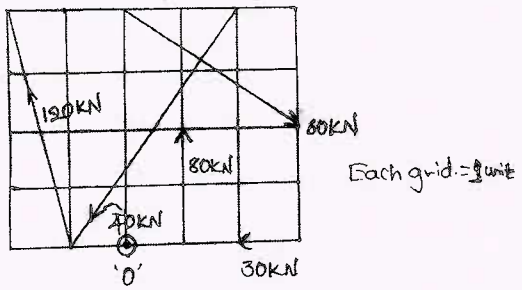

Fig Q6(b) **(10 Marks)**

Module-4

7 a. Differentiate between centroid and moment of Interia. **(04 Marks)**

b. State and prove parallel axis theorem. **(06 Marks)**

c Locate the Centroid of shaded area shown in the Fig Q7(c).

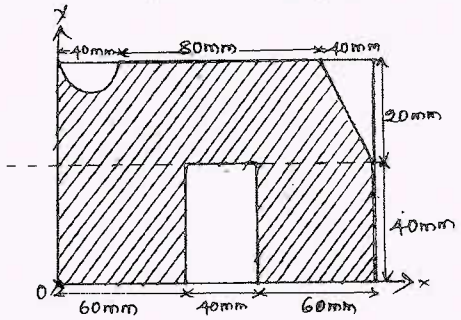

Fig Q7(c) **(10 Marks)**

OR

8 a. Derive an Expression for centroid of quarter circle of radius' R'. **(08 Marks)**

b. Determine the moment of inertia about x-x axis shown in Fig Q8(b) all dimension are in mm.

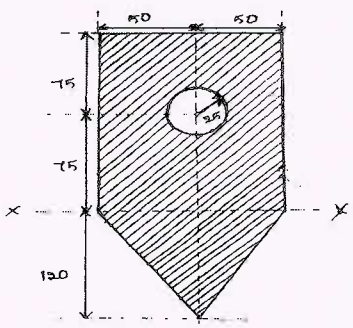

Fig Q8(b) **(12 Marks)**

Module-5

9 a. With a neat figure and equation define the following :
i) Path of projectile ii) Horizontal Range iii) Time of flight
iv) Super elevation v) Average velocity. **(10 Marks)**

b. A Pulley 300mm in diameter is wounded round by a rope with one of the ends of rope fixed to pulley and the other end is fixed to a weight freely hanging as shown in Fig Q9(b). The weight moves down by 8m after starting from rest in 4 seconds. Find the angular velocity of the pulley. Find also the total distance to moved by weight to make the pulley to rotates 400 rpm.

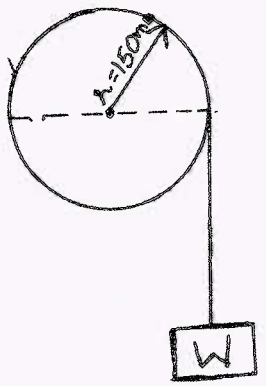

Fig Q9(b) **(10 Marks)**

OR

10 a. An automobile weighing 30kN moves on a road with longitudinal, section shown in Fig Q10(a), if it is moves with a velocity of 72kmph, what is the vertical reaction. Expressed at the points P, Q, and R.

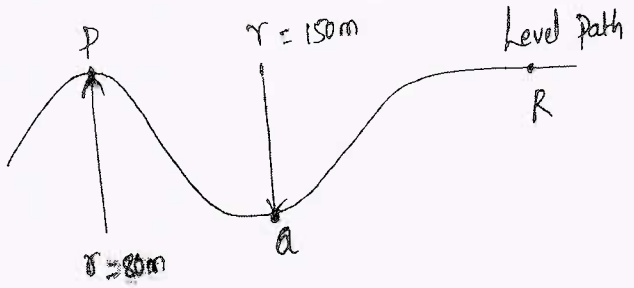

Fig Q10(a) **(10 Marks)**

b. A motorist is travelling on a straight road at a speed of 10m/sec. When he observes that the traffic. Signal 600m ahead of him turn red. The traffic light is timed to stay red for 15sec, if the motorist wishes to pass the light without stopping just as it turns green again than find :
i) uniform acceleration of the motorist
ii) speed of the car is it passes the traffic light. **(10 Marks)**

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CBCS SCHEME

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15CPH18/28

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Constitution of India, Professional Ethics and Human Rights

(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 40

INSTRUCTIONS TO THE CANDIDATES

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

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1. Which Fundamental Right of Indian Constitution has been deleted by 44th Amendment Act 1978?
   a) Right against exploitation
   b) Right to property
   c) Right to strike and protest
   d) Right to speech

2. Minimum age to contest Vidhan Parishat
   a) 25 yrs
   b) 30 yrs
   c) 35 yrs
   d) 40 yrs

3. National Emergency is provided in
   a) Art. 370
   b) Art. 360
   c) Art. 14
   d) Art. 352

4. Which state in India has its own constitution
   a) Kerala
   b) Jammu & Kashmir
   c) Assam
   d) Bihar

5. Directive principles are aimed to establish
   a) Welfare State
   b) Democratic State
   c) Modern State
   d) Socialist State

6. India has
   a) Presidential system
   b) Dictatorship
   c) Heriditary rule
   d) Parliamentary system

7. In which situation President can declare ordinances
   a) During Election
   b) When Parliament is not in session
   c) Emergency
   d) None of above

8. Who said Art. 32 of the Indian Constitution is Heart and Soul of the Indian Constitution?
   a) Jawaharlal Nehru b) Lal Bahadur Shastri c) Dr. B.R. Ambedkar d) Mahatma Gandhi

9. Election Commissioner can be removed only by
   a) Impeachment b) By giving notice c) By Court d) By President

10. 74th Amendment to Indian Constitution deals with
    a) Rural self Government b) Urban self Government
    c) Federal Government d) Right to Vote

11. Right to Religion is mentioned in which Article of the Indian Constitution
    a) Article 14 - 18 b) Article 19 - 22 c) Article 23 - 24 d) Article 25 - 28

12. Who is the Real Executive in State
    a) Governor b) Speaker of Vidhana Sabha
    c) Chief Minister d) Chief Justice of High Court

13. Guardian of Indian Constitution
    a) Law Commission b) President of India c) Prime Minister d) Supreme Court

14. Sole channel of communication between the Governor and State Cabinet is
    a) Chief Minister b) Chief Secretary c) Speaker d) None of the above

15. Vice President is Ex – Officio Chairman of the
    a) Rajya Sabha b) Election commission
    c) Lok Sabha d) Planning commission

16. Right of minorities to start Academic Institution is guaranteed by the
    a) Article 29 b) Article 31 c) Article 30 d) Article 28

17. In case of illegal imprisonment the writ issued is
    a) Mandamus b) Habeas Corpus c) Quo - Warrento d) CERTIORARI

18. Police must produce the arrested persons to the nearest police station within
    a) 96 hrs b) 72 hrs c) 36 hrs d) 24 hrs

19. To respect the National Flag is
    a) Fundamental Right b) Directives principles c) Fundamental Duty d) Common Sense

20. The word Fraternity in the Preamble of Indian Constitution means
    a) Brotherhood b) Enemity c) Clash d) Equality

21. Cooking means
    a) Boiling under pressure b) Retaining result which fit the Theory
    c) Making deceptive statements
    d) Misleading the public about the quality of the product.

22. This is not the dishonesty in Engineering
    a) Cooking b) Forging c) Blending d) Trimming

23. Group Think.
    a) Give good result
    b) Leads to better result
    c) Widens our knowledge
    d) Is an impediment to responsibility

24. One of the basic attitudes towards responsibility is
    a) Vigilant view
    b) Minimalist view
    c) Moralistic view
    d) Maximalist view

25. The right to live with dignity includes in
    a) Preamble of the Indian Constitution
    b) The right to life
    c) The right to Equality
    d) The right to Social & Economic Justice

26. The owner of the Patent Right retains his rights for
    a) 100 years
    b) 50 years
    c) 20 years
    d) 75 years

27. Plagiarism means
    a) Telling lies
    b) Advocating the Theory
    c) Using one's own ideas
    d) Illegitimate use of others ideas

28. Virtues of Engineers are
    a) Benevolence, attitudes and disposition
    b) Goodness, Perseverance and Ambition
    c) Honesty Integrity and Reliability
    d) None of the above

29. Deliberate deception is
    a) an impediment to responsibility
    b) one of the ways of misusing the truth
    c) one of the approach to responsibility
    d) None of the above

30. Engineering codes requires Engineers to hold paramount
    a) The dignity of the profession
    b) The interest of Employers and clients
    c) The safety and welfare of society
    d) The confidential information given by his client.

31. The International Women's day is celebrated on
    a) 8th March
    b) 10th March
    c) 15th March
    d) 3rd June

32. Which one of the following is not a kind of Human Right
    a) Civil and Political Right
    b) Economic Social and Cultural Right
    c) Group Right
    d) Customs and Conventions

33. Which rights of the following are regarded as 1st Generation Right
    a) Humanitarian Right
    b) Group Right
    c) Economic Social and Cultural Rights
    d) Civil and Political Rights

34. Social Discrimination means
    a) Discrimination on the basis of Education
    b) Discrimination on the basis of Ideology
    c) Discrimination on the basis of caste, religion , race and economic status
    d) All the above

35. Universal declaration of Human Rights adopted by the U.N.O on
    a) 10th December, 1948
    b) 24th December, 1948
    c) 29th December, 1948
    d) 1st December, 1948

36. Which one of the following is a Non political , Independent International Organization
    a) National Commission for Human Rights
    b) United Nations Organization
    c) International Labour Organization
    d) AMNESTY INTERNATIONAL

37. As per National Commission for Minorities Act 1992 who are minorities in India?
    a) Muslims and Christians
    b) Jains and Buddhists
    c) Sikhs and Parris
    d) All the above

38. The National Human Rights Commission was established on
    a) 7th September, 1993
    b) 17th September, 1993
    c) 10th September, 1993
    d) 27th September, 1993

39. Who is the integral part of the Parliament
    a) Speaker
    b) Prime Minister
    c) Governor
    d) President of India

40. Who has the power to increase the number of Judges of the Supreme Court
    a) Union Parliament
    b) Prime Minister
    c) President of India
    d) Chief Justice of India.

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