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18PHY12

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

## Engineering Physics

Time: 3 hrs.

Max. Marks: 100

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

- 2. Physical constants :*
- Velocity of light,  $c = 3 \times 10^8$  m/s*
  - Planck's constant,  $h = 6.63 \times 10^{-34}$  JS*
  - Mass of electron,  $m_e = 9.1 \times 10^{-31}$  kg*
  - Charge of electron,  $e = 1.6 \times 10^{-19}$  C*
  - Boltzmann constant =  $1.38 \times 10^{-23}$  JK<sup>-1</sup>*
  - Avagadro number =  $6.02 \times 10^{23}$ /mol.*

### Module-1

- 1
- a. What are shock waves? Mention the characteristics and applications of shock waves. (06 Marks)
  - b. What are damped oscillations? Give the theory of damped oscillations and hence discuss the case of critical damping. (10 Marks)
  - c. A free particle is executing simple harmonic motion in a straight line with a period of 25 seconds; 5 seconds after it has crossed the equilibrium point, the velocity is found to be 0.7 m/s. Find the displacement at the end of 10 seconds and also amplitude of oscillations. (04 Marks)

**OR**

- 2
- a. Define SHM. Mention the characteristics of SHM. Give one example of SHM. (06 Marks)
  - b. With a neat diagram, explain the construction and working of Reddy's shock tube. Mention conservation of mass energy and momentum expressions. (10 Marks)
  - c. A mass of 0.5kg causes an extension of 0.03m in a spring and the system is set for oscillations. Find i) The force constant for the spring ii) Angular frequency and iii) Time period of the resulting oscillation. (04 Marks)

### Module-2

- 3
- a. State and explain Hooke's law. Define elastic and plastic limits. (06 Marks)
  - b. Define Young's modulus of materials. Derive an expression for the Young's modulus of a beam using single cantilever method. (10 Marks)
  - c. Calculate the torque required to twist a wire of length 1.5m, radius  $0.0425 \times 10^{-2}$  m through an angle of  $(\pi/45)$  radians, if the value of rigidity modulus of the material is  $8.3 \times 10^{10}$  N/m<sup>2</sup>. (04 Marks)

**OR**

- 4
- a. What is Bending moment? Mention various types of beams and their engineering applications (any four). (06 Marks)
  - b. What are the types of Elastic moduli? Derive a relation between Y, K and  $\sigma$ . (10 Marks)
  - c. Calculate the Force required to produce an extension of 1mm in steel wire of length 2m and diameter 1mm. ( $Y = 2 \times 10^{11}$  N/m<sup>2</sup>) (04 Marks)

**Module-3**

- 5 a. What is Numerical Aperture? Derive an expression for the same. (06 Marks)  
 b. State and explain Maxwell's equation for electromagnetic field. Starting from Maxwell's equations, deduce the wave equation for a plane wave in free space. (10 Marks)  
 c. Determine constant C, such that  $\vec{A} = (x + ay)\hat{a}_x + (y + bz)\hat{a}_y + (x + cz)\hat{a}_z$  is solenoidal. (04 Marks)

OR

- 6 a. Explain the types of fiber losses. (06 Marks)  
 b. State and explain Gauss Divergence theorem. Mention the Stoke's theorem. (10 Marks)  
 c. The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. (04 Marks)

**Module-4**

- 7 a. Setup one dimensional time independent Schrödinger wave equation. (06 Marks)  
 b. Mention the three modes of vibration in CO<sub>2</sub> molecule. With neat diagrams explain the construction and working of CO<sub>2</sub> laser. (10 Marks)  
 c. A pulsed laser emits photons of wavelength 780nm with 20mW average power/pulse. Calculate the number of photons contained in each pulse if the pulse duration is 10ns. (04 Marks)

OR

- 8 a. Prove that electron cannot exist inside the Nucleus of an atom. (06 Marks)  
 b. Derive an expression for energy density in terms of Einstein's coefficients. (10 Marks)  
 c. An electron is bound in a one dimensional potential well of width 1Å, but infinite wall height. Find its energy values in the ground state and in the first two excited states. (04 Marks)

**Module-5**

- 9 a. What are the assumptions of Quantum Free Electron Theory (QFET)? Explain the merits of QFET. (06 Marks)  
 b. What is Hall Effect? Derive an expression for Hall voltage in terms of Hall coefficient. (10 Marks)  
 c. Find the temperature of which there is 1% probability that a state with an energy 0.5eV above the Fermi energy is occupied. (04 Marks)

OR

- 10 a. What is polarization? Explain various types of polarizations mechanisms. (06 Marks)  
 b. What is Fermi Energy? Derive an expression for Fermi Energy at zero Kelvin for a metal. (10 Marks)  
 c. The resistivity of intrinsic germanium at 27°C is equal to 0.47 ohm-m. Assuming the electron and hole mobilities as 0.38 and 0.18 m<sup>2</sup>/V-Sec respectively. Calculate the intrinsic carrier density. (04 Marks)

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# CBCS SCHEME

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17PHY12/22

## First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 Engineering Physics

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Physical constants; Velocity of light,  $c = 3 \times 10^8$  m/s mass of the electron,  $m = 9.1 \times 10^{-31}$  kg Planck's constant,  $h = 6.625 \times 10^{-34}$  JS charge of electron,  $e = 1.6 \times 10^{-19}$  C Boltzmann's constant  $K = 1.382 \times 10^{-23}$  J/K Avagadro's number,  $N_A = 6.02 \times 10^{26}$ /K mole.

### Module-1

- 1 a. Define group velocity and phase velocity and hence obtain the relation between them. (06 Marks)  
b. Mention any four important characteristics of matter waves. (04 Marks)  
c. Assuming time independent Schrodinger wave equation, obtain an expressions for energy eigen value and eigen function for an electron in one dimensional potential well of infinite wall height. (07 Marks)  
d. The velocity of uncertainty electron was observed to be  $5 \times 10^3$  m/s. Using Heisenberg uncertainty principle. Calculate the uncertainty of an electron in its position. (03 Marks)

OR

- 2 a. Mention assumption of Planck's law. Obtain Wien's law and Rayleigh-Jean's law from Planck's law for shorter and longer wavelength limits. (07 Marks)  
b. Set up time independent one dimensional Schrodinger wave equation. (07 Marks)  
c. Briefly explain probability density of wave function. (03 Marks)  
d. An electron has K.E. 120 eV. Find its de Broglie wavelength. (03 Marks)

### Module-2

- 3 a. Discuss the merits of quantum free electron theory. (06 Marks)  
b. Derive an expression for electrical conductivity of an intrinsic semiconductor. (05 Marks)  
c. What is Meissner effect? Explain Type-I and Type-II superconductors. (05 Marks)  
d. Find the temperature at which there is 1% Probability that a state with energy 0.5 eV above Fermi energy is occupied. (04 Marks)

OR

- 4 a. Derive an expression for electrical conductivity based on quantum free electron theory. (06 Marks)  
b. Define mobility factor, drift velocity, mean collision time and relaxation time. (04 Marks)  
c. What is superconductivity? Explain BCS theory of superconductivity. (06 Marks)  
d. For intrinsic gallium arsenide at room temperature, the electrical conductivity is  $10 \text{ ohm}^{-1}\text{m}^{-1}$ . The electron and hole mobilities are  $8.85 \text{ m}^2/\text{vs}$  and  $0.04 \text{ m}^2/\text{vs}$  respectively. Calculate the intrinsic carrier concentration. (04 Marks)

1 of 2

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

**Module-3**

- 5 a. Obtain an expression for energy density of radiation under thermal equilibrium condition in terms of Einstein's coefficients. (07 Marks)
- b. Explain the recording and reconstruction technique of holography. (05 Marks)
- c. Discuss point to point optical fiber communication system with neat block diagram. (05 Marks)
- d. Calculate V-number for an optical fiber of core diameter  $45 \times 10^{-6}$  m and with refractive indices 1.45 and 1.40 respectively for core and cladding when the wavelength of the propagation wave is  $700 \times 10^{-9}$  m. (03 Marks)

**OR**

- 6 a. Describe the construction and working of CO<sub>2</sub> laser with suitable diagrams and mention some important applications. (08 Marks)
- b. Explain the condition for lasing action. (04 Marks)
- c. Derive an expression for numerical aperture of an optical fiber and hence show the condition for propagation. The refractive indices of core and cladding are 1.50 and 1.48 respectively. Calculate the numerical aperture of an optical fiber. (08 Marks)

**Module-4**

- 7 a. Define atomic packing factor, calculate the atomic packing factor for SC, BCC and FCC structure. (08 Marks)
- b. Explain in brief the seven crystal system with neat diagrams. (07 Marks)
- c. What are Miller indices? Explain the procedure of finding Miller indices. (05 Marks)

**OR**

- 8 a. Describe the construction and working of Bragg's spectrometer and hence how it is used to determine crystal structure. (08 Marks)
- b. Derive an expression for inter planar spacing in terms of Miller indices. (06 Marks)
- c. Explain the crystal structure of diamond with neat sketch. (06 Marks)

**Module-5**

- 9 a. Explain the construction and working of Reddy shock tube and explain any three important applications. (08 Marks)
- b. Describe the principle, construction and working of SEM with neat diagram. (08 Marks)
- c. Explain the types of Carbon nano tubes with diagrams. (04 Marks)

**OR**

- 10 a. Explain Rankine-Hugoniot equations for a normal shock wave. (06 Marks)
- b. Describe the top down approach of preparation of nanomaterials by ball milling method. (05 Marks)
- c. Describe Arc discharge method of obtaining CNTs with neat diagram. (05 Marks)
- d. Define Mach number, subsonic wave, ultrasonic wave and supersonic wave. (04 Marks)

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18CIV14

## First Semester B.E. Degree Examination, Dec.2018/Jan.2019 Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Briefly explain the scopes of branches:
  - i) Transportation Engineering
  - ii) Geotechnical Engineering. (10 Marks)
- b. What are the effects of infrastructural facilities on socio-economic development of a country? (05 Marks)
- c. What is the role of a civil engineer in infrastructural development of a country? (05 Marks)

**OR**

- 2 a. Explain briefly,
  - i) Law of physical independency of forces. (06 Marks)
  - ii) Law of superposition of forces. (06 Marks)
- b. State and prove Varignon's law of moments. (06 Marks)
- c. Find the moment of 100kN force acting on a rigid body ABC as shown in Fig.Q.2(c), about point A. (08 Marks)

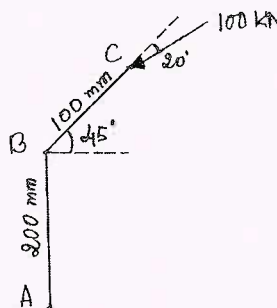


Fig.Q.2(c)

### Module-2

- 3 a. Define Free Body Diagram, with the help of at least two examples. What is the importance of drawing a F.B.D (Free Body Diagram) in Engineering Mechanics? (05 Marks)
- b. What are the laws of dry friction? (05 Marks)
- c. A mass of 580 kg resting on a rough inclined plane is acted upon by a 6000N force as shown in Fig.Q.3(c). If the coefficient of friction is 0.25 at point of contact, check whether the body slides up or down. (10 Marks)

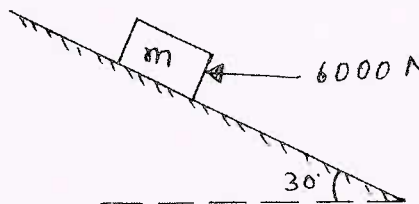


Fig.Q.3(c)

1 of 3

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

OR

- 4 a. State and prove Lami's theorem. (04 Marks)  
 b. Find the reactions developed at contact points A, B and C supporting two identical rollers each of weight 1000N as shown in Fig.Q.4(b) (06 Marks)

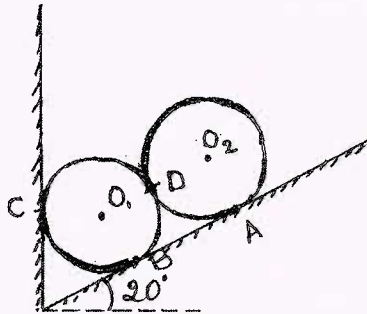


Fig.Q.4(b)

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

**Module-3**

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

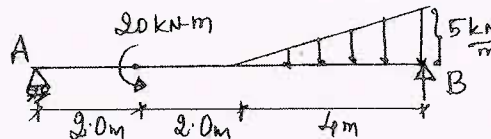


Fig.Q.5(a)

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

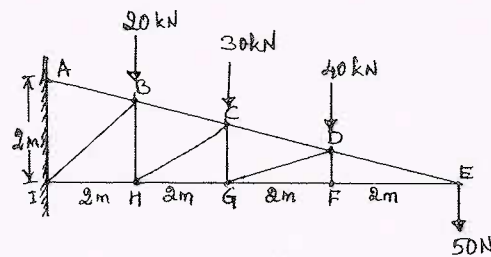


Fig.Q5(b)

OR

- 6 a. Differentiate statically determinate and indeterminate structures with examples for each. (06 Marks)  
 b. Determine member forces in the truss shown in Fig.Q.6(b). (14 Marks)

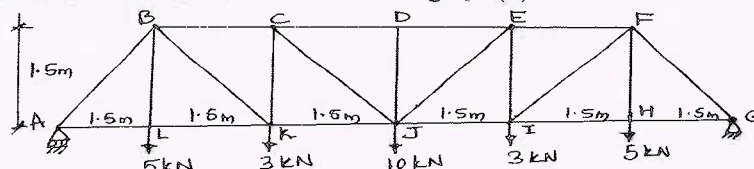


Fig.Q.6(b)

**Module-4**

- 7 a. Derive the expression for centroid of a semi-circle from first principle. (06 Marks)  
 b. Determine the centroid of shaded area of composite shown in Fig.Q.7(b) with respect to origin 'O'. (14 Marks)

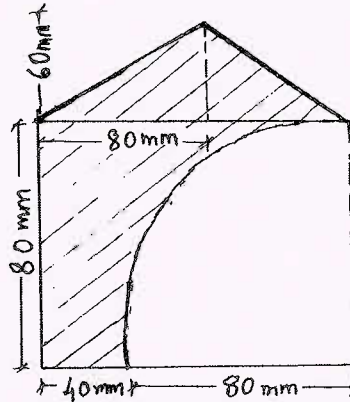


Fig.Q.7(b)

OR

- 8 a. State and prove Parallel axis theorem. (06 Marks)  
 b. Find radius of gyration of plane lamina about its horizontal centroidal axis shown in Fig.Q.8(b). (14 Marks)

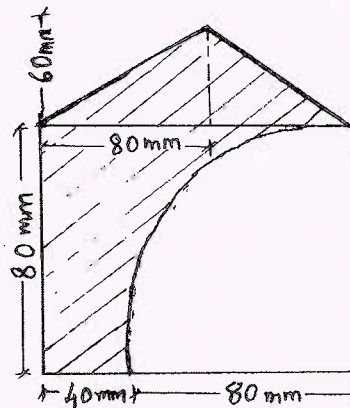


Fig.Q.8(b)

**Module-5**

- 9 a. Two cars P and Q accelerates from a standing start. The acceleration of P is  $1.3 \text{ m/s}^2$  and that of Q is  $1.6 \text{ m/s}^2$ . If Q was originally 6m behind P, how long it takes to overtake P? (10 Marks)  
 b. A stone 'A' is dropped from top of a tower 50m high. At the same time another stone 'B' is thrown up from the foot of the tower with the velocity of 25m/s. At what distance from top and after how much time the two stones will cross each other. (10 Marks)

OR

- 10 a. State D' Alembert's principle and write significance of it structural dynamics. (06 Marks)  
 b. A cricket ball is thrown by a fielder in the ground from a height of 3m at an angle of  $40^\circ$  with the horizontal. The velocity with which the ball is thrown is 30m/s. The ball hits the wicket at a height of 0.3m from ground. Determine the distance of the fielder from the wicket when the ball is thrown. (14 Marks)

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# CBCS SCHEME

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17CIV13/23

## First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- Explain briefly scope of civil engineering in, i) Structural Engineering ii) Transportation Engineering. (06 Marks)
  - Explain briefly the impact of infrastructure on the socioeconomic development of country. (06 Marks)
  - State and explain different elements of force. (04 Marks)
  - Find the moment of force  $F = 600\text{N}$  about 'A' as shown in Fig.Q.1(d). (04 Marks)

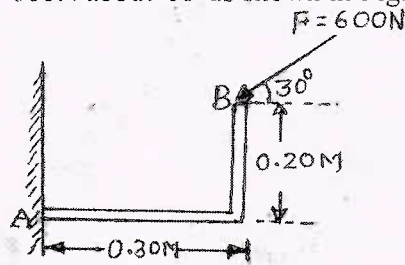


Fig.Q.1(d)

OR

- State and explain principle of transmissibility of forces. (04 Marks)
  - Differentiate between flexible pavement and rigid pavement. (04 Marks)
  - A block of  $200\text{N}$  is kept on the inclined plane and is fixed to the plane. Find the components of weight in the direction along the plane and perpendicular to the plane as indicated in Fig.Q.2(c). (06 Marks)

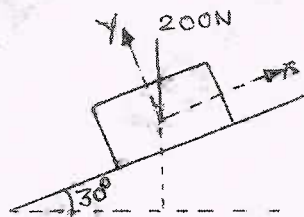


Fig.Q.2(c)

- Replace the horizontal force of  $600\text{N}$  acting on the lever by an equivalent system consisting of a force and a couple at 'O' as shown in Fig.Q.3. (06 Marks)

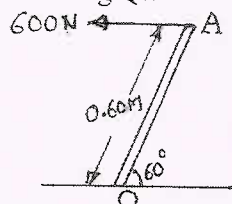


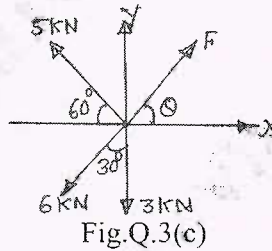
Fig.Q.2(d)

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



**Module-2**

- 3 a. State and prove law of parallelogram of forces. (06 Marks)  
 b. Explain with neat diagram,  
 i) Coefficient of friction  
 ii) Angle of repose  
 iii) Cone of friction. (06 Marks)  
 c. The four coplanar concurrent forces acting at a point are as shown in Fig.Q.3(c). One of the force is unknown and its magnitude is as shown by 'F'. The resultant of these forces is 5kN and is acting along x-axis. Determine the force F and its inclination 'θ' with x-axis. (08 Marks)



OR

- 4 a. State and prove Lami's theorem. (04 Marks)  
 b. Compute the tensions in the strings AB, BC and CD as shown in Fig.Q.4(b). (08 Marks)

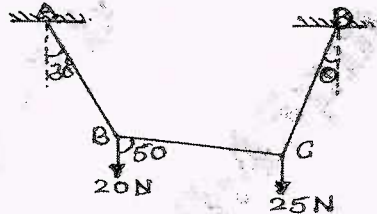


Fig.Q.4(b)

- c. Two blocks A and B weighing 2kN and 1.5kN are connected by a wire passing over a smooth frictionless pulley as shown in Fig.Q.4(c). Determine the magnitude of force 'P' required to impound motion. Take  $\mu = 0.20$ . (08 Marks)

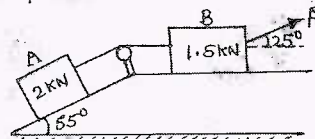


Fig.Q.4(c)

**Module-3**

- 5 a. State and explain Varignon's theorem. (06 Marks)  
 b. What are the types of loads and supports a beam may have? Explain briefly with neat sketches. (06 Marks)  
 c. Determine the position, magnitude and direction of resultant of the forces acting on a body as shown in Fig.Q.5(c) with respect to point A. (08 Marks)

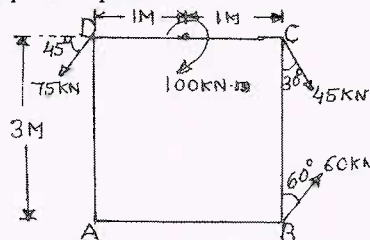


Fig.Q.5(c)

OR

- 6 a. Define Equilibrant. Explain the conditions of equilibrium of coplanar concurrent force system and coplanar non concurrent force system. (06 Marks)
- b. Find the reactions for a cantilever beam as shown in Fig.Q.6(b) (06 Marks)

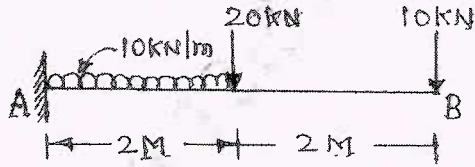


Fig.Q.6(b)

- c. Determine the support reactions for the overhanging beam as shown in Fig.Q.6(c). (08 Marks)

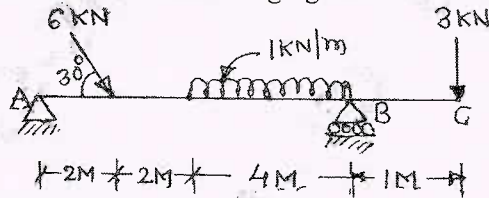


Fig.Q.6(c)

**Module-4**

- 7 a. Determine the centroid of a semicircular lamina of radius 'R' by the method of integration. (08 Marks)
- b. Find the polar moment of inertia of the section as shown in Fig.Q.7(b), about an axis passing through its centroid and find polar radius of gyration. (12 Marks)

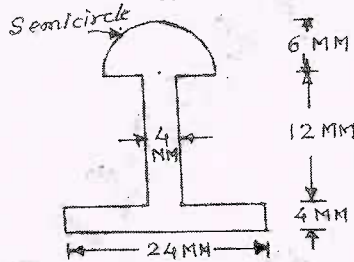


Fig.Q.7(b)

OR

- 8 a. State and prove parallel axis theorem. (06 Marks)
- b. With reference to the coordinate axes x and y, locate the centroid of the area shown in Fig.Q.8(b). (14 Marks)

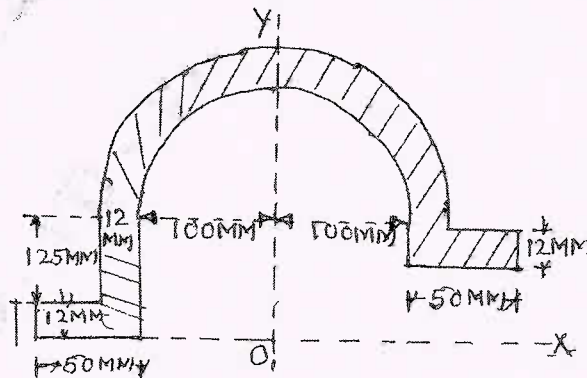


Fig.Q.8(b)

**Module-5**

- 9 a. Define the following: i) Kinematics ii) Kinetics iii) Motion iv) Path. (06 Marks)  
 b. What is centrifugal force and super elevation? (06 Marks)  
 c. A Burglar's car starts at an acceleration of  $2\text{m/sec}^2$ . A police vigilant party came after 5 seconds and continued to chase the Burglar's car with a uniform velocity of  $20\text{m/sec}$ . Find the time taken in which the police van will overtake the car. (08 Marks)

**OR**

- 10 a. Define the following: i) Uniform velocity ii) Rectilinear motion iii) Curvilinear motion iv) Projectile. (04 Marks)  
 b. Determine the position at which the ball is thrown up the plane will strike the incline plane as shown in Fig.Q.10(b). The initial velocity is  $30\text{m/sec}$  and angle of projection is  $\tan^{-1}\left(\frac{4}{3}\right)$  with horizontal. (08 Marks)

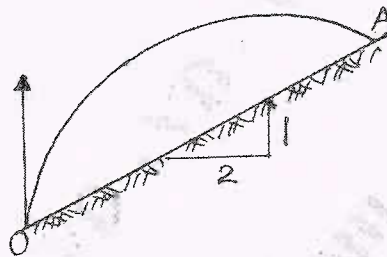


Fig.Q.10(b)

- c. A stone is dropped into a well and a sound of splash is heard after 4 seconds. Find the depth of well if the velocity of sound is  $350\text{ m/sec}$ . (08 Marks)

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15CIV13/23

## First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1
- a. Explain role of civil engineer in the infrastructural development. (06 Marks)
  - b. Define force and its characteristics. (03 Marks)
  - c. Determine the angle  $\theta$  for the force  $F = 200\text{N}$  shown in Fig Q1(c) so that it produces
    - i) maximum moment about A
    - ii) the minimum moment about A. Determine the maximum and minimum moment. (07 Marks)

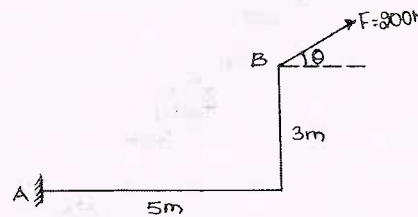


Fig Q1(c)

OR

- 2
- a. Explain different types of roads. (04 Marks)
  - b. Explain with neat sketch law of physical independence, Law of super position and law of transmissibility of force. (06 Marks)
  - c. The moment of a certain force  $F$  is  $180\text{ kN-m}$  clockwise about  $O$  and  $90\text{ kN-m}$  counter clockwise about  $B$ . If its moment about  $A$  is zero, determine the force  $F$  for Fig Q2(c).

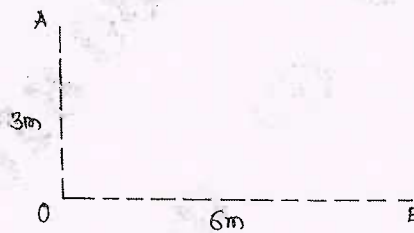


Fig Q2(c)

(06 Marks)

### Module-2

- 3
- a. Stat and prove parallelogram law of forces. (05 Marks)
  - b. Forces are transmitted by two members as shown in Fig Q3(b). If the resultant of these forces is  $1400\text{N}$  directed upward vertically, find angle  $\alpha$  and  $\beta$ .

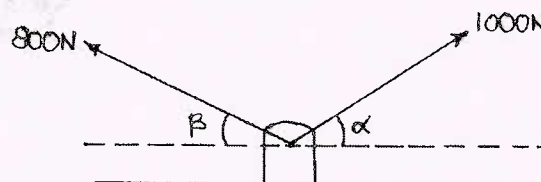


Fig Q3(b)

(06 Marks)

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

- c. Compute the resultant of the force system as in Fig Q3(c).

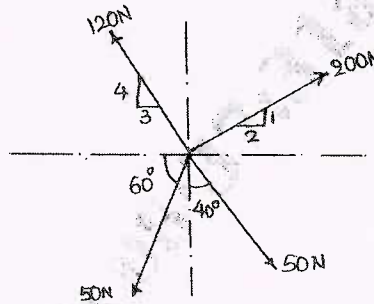


Fig Q3(c)

(05 Marks)

OR

- 4 a. State prove Lami's theorem. (05 Marks)  
 b. Determine the tension in the string and the reaction at contact surface for the cylinder of weight 1000N placed as shown in Fig 4(b). (05 Marks)

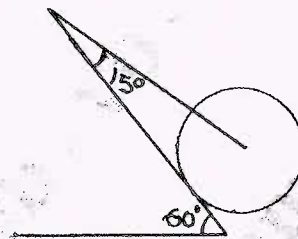


Fig Q4 (b)

- c. What should be the value of  $\theta$  in Fig Q4(c) which will make the motion of 900N block down the plane to impend? The coefficient of friction for all contact surfaces is 0.33.

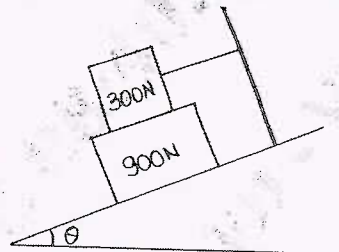


Fig Q4(c)

(06 Marks)

**Module-3**

- 5 a. State and prove Varignon's principle of moments. (06 Marks)  
 b. Determine the resultant of the force system acting on the plate as shown in Fig Q5(b) with respect to AB and AD. (10 Marks)

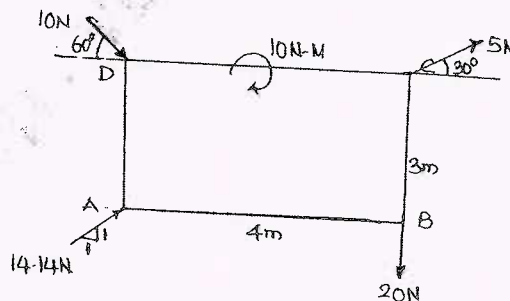


Fig Q5(b)

2 of 4

OR

- 6 a. Explain with neat sketch different types of beams and loadings. (06 Marks)  
 b. Determine the reactions at A and B for the loaded beam shown in Fig Q6(b).

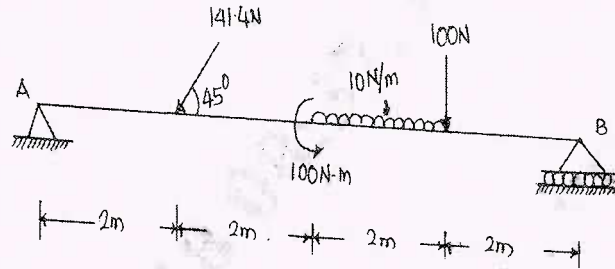


Fig Q6(b)

(10 Marks)

**Module-4**

- 7 a. State and prove parallel axes theorem. (06 Marks)  
 b. Determine the position of the centroid for the shaded area with respect to the axes shown in Fig Q7(b).

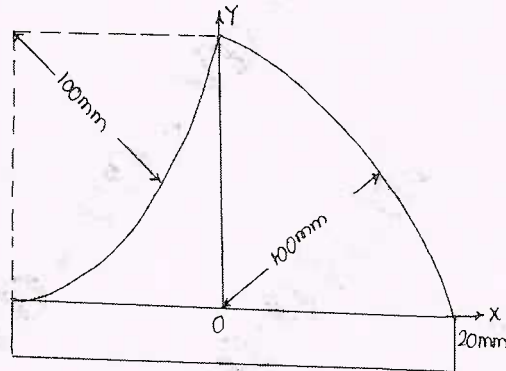


Fig Q7(b)

(10 Marks)

OR

- 8 a. From first principle derive the relation for centroid of a triangle with base  $b$  and height  $h$ . (06 Marks)  
 b. Determine the moment of inertia of a prestressed concrete beam section shown in Fig Q8(b) about horizontal and vertical axis passing through centroid.

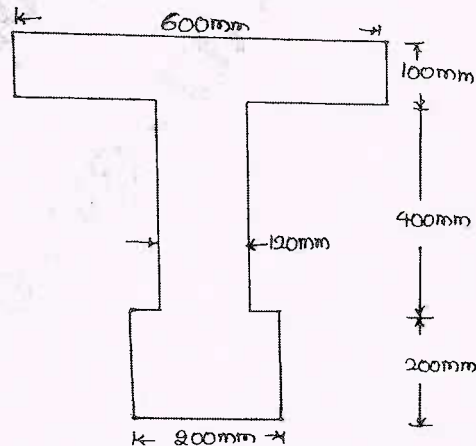


Fig Q8(b)

(10 Marks)

**Module-5**

- 9 a. Explain Displacement, Distance travelled, velocity and acceleration in rectilinear kinematic. (08 Marks)
- b. A sprinter in a 100m race accelerates uniformly for the first 40m and then runs with constant velocity. If the sprinter's time for the first 40m is 5.2 seconds, determine his time for race. (04 Marks)
- c. A ball is projected vertically upwards with a velocity of 20m/sec. Two seconds later, a second ball is projected vertically upwards with a velocity of 16m/sec. Find the height above the surface at which the two ball meet. (04 Marks)

**OR**

- 10 a. A cricket ball thrown from a height of 1.8m above ground level at an angle of  $30^\circ$  with the horizontal with a velocity of 12m/sec is caught by a fielder at a height of 0.6m above the ground as shown in Fig Q10(a). Determine the distance between the two players.

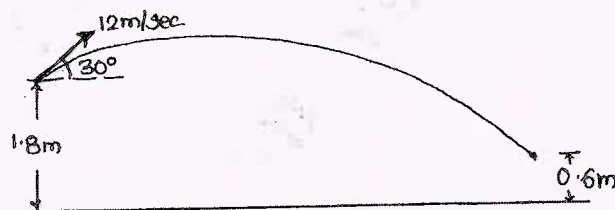


Fig Q10(a)

(08 Marks)

- b. The motion of a particle starting from rest is defined by  $a = 10t - t^2$  where  $a$  is in  $\text{m/sec}^2$  and  $t$  is in seconds. Find the displacement before it starts in reverse direction of motion and velocity when acceleration changes its direction. (08 Marks)

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# CBCS SCHEME

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17EME14/24

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

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Explain petroleum based gaseous fuels. (06 Marks)  
b. Explain the principle and working of a wind mill with neat sketch. (08 Marks)  
c. Bio-fuels are alternate for fossil fuels, explain. (06 Marks)

OR

- 2 a. Explain with neat sketch the construction and working of Babcock and Wilcox boiler. (10 Marks)  
b. List the differences between fire tube and water tube boilers. (06 Marks)  
c. Explain any 4 devices which are necessary for safe operation of boilers. (04 Marks)

### Module-2

- 3 a. Explain with neat sketch Parson turbine and its pressure velocity diagram. (08 Marks)  
b. List the differences between open cycle and closed cycle gas turbine. (06 Marks)  
c. Explain the constructions and working of a Kaplan turbine with neat sketch. (06 Marks)

OR

- 4 a. Bring out the comparisons between 2-stroke and 4-stroke IC engine. (06 Marks)  
b. Explain with neat sketch a 4 stroke engine where combustion of fuel takes place at constant pressure. (07 Marks)  
c. A gas engine working on a 4 stroke cycle has a cylinder diameter of 0.25m and length 0.45m and running at 180RPM. Its mechanical efficiency is 80% and when mean effective pressure is 6 bar. Find the indicated power, break power and frictional power. What is its fuel consumption rate (kg/hr) and break specific fuel consumption (kg/kwh) if the energy content of the fuel is 42,000 kJ/kg and brake thermal efficiency is 25%. (07 Marks)

### Module-3

- 5 a. Explain knurling operations with a neat sketch. (06 Marks)  
b. Explain with neat sketches counter sinking and counter boring operations. (08 Marks)  
c. List the various milling operations and explain a milling operation using side and face cutter. (06 Marks)

1 of 2

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



OR

- 6 a. Classify robots based on physical configuration and explain a robot which has a work envelop of hemisphere with neat sketch. (08 Marks)
- b. Explain the necessity of automation and important features of flexible automation. (06 Marks)
- c. List any 2 advantages, limitations and applications of NC/CMC machines. (06 Marks)

Module-4

- 7 a. Explain composite materials and its need in today's world. (06 Marks)
- b. Classify Ferrous metals with suitable example. (06 Marks)
- c. Define non-ferrous metals and explain any two non-ferrous metals and two alloys. (08 Marks)

OR

- 8 a. List out the comparison between soldering and brazing. (06 Marks)
- b. Explain with neat sketch the electrodes used in arc welding and its functions. (06 Marks)
- c. Explain oxy-acetylene welding process with neat sketch. (08 Marks)

Module-5

- 9 a. Define refrigerant and explain commonly used refrigerant (any 3). (06 Marks)
- b. Explain with neat sketch the principles and working of a vapour compression refrigerator. (08 Marks)
- c. Define the following : i) ton of refrigeration ii) coefficient of performance iii) relative COP. (06 Marks)

OR

- 10 a. Explain with a neat sketch, working of room air conditioner. (08 Marks)
- b. Explain with neat sketch the working of vapor absorption refrigerator. (08 Marks)
- c. List out the properties of a good refrigerant. (04 Marks)

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18ELE13

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

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. State and explain Kirchoff's laws as applied to an electric circuit. (06 Marks)
- b. Given the network shown in Fig. Q1 (b), determine  $I_1$ ,  $E$ ,  $I_3$  and  $I$ . If voltage across  $9\ \Omega$  resistor is  $27\text{ V}$ . (08 Marks)

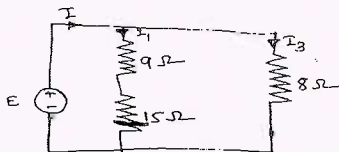


Fig. Q1 (b)

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

OR

- 2 a. Define the (i) Frequency (ii) Form factor & (iii) Peak factor of sinusoidally varying voltage. (06 Marks)
- b. The instantaneous values of two alternating voltages are represented respectively by  $V_1 = 60\sin\theta$  volts and  $V_2 = 40\sin\left(\theta - \frac{\pi}{3}\right)$  volts. Derive an expression for instantaneous value of: (i) the sum (ii) the difference of these voltages. (08 Marks)
- c. For the network shown in Fig. Q2, calculate the power consumed by each resistor. (06 Marks)

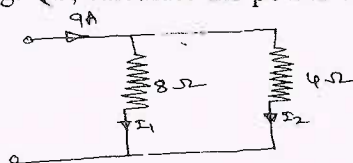


Fig. Q2

### Module-2

- 3 a. Show that voltage and current in pure resistive circuit are in phase and power consumed in the circuit is equal to product of rms voltage and current. The circuit is excited by the a.c. source. (06 Marks)
- b. A resistance of  $7\ \Omega$  is connected in series with a pure inductance of  $31.8\text{ mH}$  and the circuit is connected to a  $100\text{ V}$ ,  $50\text{ Hz}$ , sinusoidal supply. Calculate (i) Circuit current (ii) Phase angle (iii) Power factor (iv) Power. (08 Marks)
- c. Two wattmeters are used to measure power in a 3-phase balanced load. The wattmeter readings are  $8.2\text{ kW}$  and  $7.5\text{ kW}$ . Calculate (i) Total power (ii) Power factor and (iii) Total reactive power. (06 Marks)

OR

- 4 a. Deduce the relationship between the phase and the line voltages of a three phase star connected system. (06 Marks)
- b. Three coils are connected in delta to a three phase, three wire,  $400\text{ V}$ ,  $50\text{ Hz}$  supply and take a line current of  $5\text{ A}$  at  $0.8\text{ p.f.}$  lagging. Calculate the resistance and inductance of the coils. (06 Marks)
- c. A coil having a resistance of  $20\ \Omega$  and inductance of  $0.0382\text{ H}$ , is connected in parallel with a circuit consisting of a  $150\ \mu\text{F}$  capacitor in series with  $10\ \Omega$  resistor. The arrangement is connected to a  $230\text{ V}$ ,  $50\text{ Hz}$  supply. Determine current in each branch. Also find total supply current. (08 Marks)

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

**Module-3**

- 5 a. Explain the construction of a single phase transformer. (06 Marks)  
 b. A 50 KVA single phase transformer has primary and secondary turns of 300 and 20 respectively. The primary winding is connected to a 2200 V, 50 Hz supply. Calculate (i) No load secondary voltage (ii) approximate values of the primary and secondary currents on full load (iii) Maximum value of flux density. (06 Marks)  
 c. With neat diagram, explain plate earthing. (08 Marks)

**OR**

- 6 a. Derive E.M.F equation of single phase transformer. (06 Marks)  
 b. With neat circuit and truth table, explain three way control of lamp. (06 Marks)  
 c. A 400 KVA transformer has a core loss of 2 kW and maximum efficiency at 0.8 p.f. occurs when the load is 240 kW. Calculate (i) The maximum efficiency at unity power factor. (ii) the efficiency on full load at 0.71 power factor. (08 Marks)

**Module-4**

- 7 a. Draw a labeled diagram of the cross section of a d.c. generator. What are the essential functions of the field coils, armature, commutator and brushes? (08 Marks)  
 b. A four-pole armature of d.c. generator has 624 lap-connected conductors and is driven at 1200 rpm. Calculate the useful flux per pole required to generate an E.M.F of 250 V. (06 Marks)  
 c. A four pole motor is fed at 440 V and takes an armature current of 50 A. The resistance of the armature circuit is 0.28 ohm. The armature winding is wave-connected with 888 conductors and useful flux per pole is 0.023 wb. Calculate back emf and speed. (06 Marks)

**OR**

- 8 a. Obtain from first principles an expression for torque developed in d.c. motor. (06 Marks)  
 b. Explain characteristics of d.c. shunt motor. (06 Marks)  
 c. A shunt generator running at 500 rpm delivers 50 kW at 200 V. The armature and field resistances are 0.02 and 40  $\Omega$  respectively. Calculate generated E.M.F if brush drop of 1 V per brush. (08 Marks)

**Module-5**

- 9 a. By means of a diagram, describe the main parts of synchronous generator with their functions. (08 Marks)  
 b. The stator of a 3-phase, 8 pole, 750 rpm alternator has 72 slots, each of which contains 10 conductors. Calculate the rms value of the emf per phase if flux per pole is 0.1 wb sinusoidally distributed. Assume full pitch coils and winding distribution factor of 0.96. (06 Marks)  
 c. A 4-pole, 3300 V, 50 Hz induction motor runs at rated frequency and voltage. The frequency of the rotor currents is 2.5 Hz. Find slip and running speed. (06 Marks)

**OR**

- 10 a. Deduce an expression for the frequency of rotor current in an induction motor. (06 Marks)  
 b. A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate,  
 (i) Synchronous speed.  
 (ii) The speed of the rotor when the slip is 0.04.  
 (iii) The frequency of the rotor current when the slip is 0.03.  
 (iv) The frequency of the rotor current at standstill. (08 Marks)  
 c. Derive e.m.f equation for synchronous generator. (06 Marks)

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## First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 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 law as applied to DC circuits. (07 Marks)
- b. What are the differences between series and parallel circuit. (06 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 energy stored in it if current rises from zero to 5A ( $\mu_r$  for paper = 1). (07 Marks)

**OR**

- 2 a. State and explain the faradays law of Electromagnetic induction (EMI). (06 Marks)
- b. Define the coefficient of coupling and find its relation with  $L_1, L_2$  and  $M$ . (06 Marks)
- c. Find the currents  $I_1, I_2$  and  $I_3$  and the voltages  $V_a, V_b$  in the network shown below :

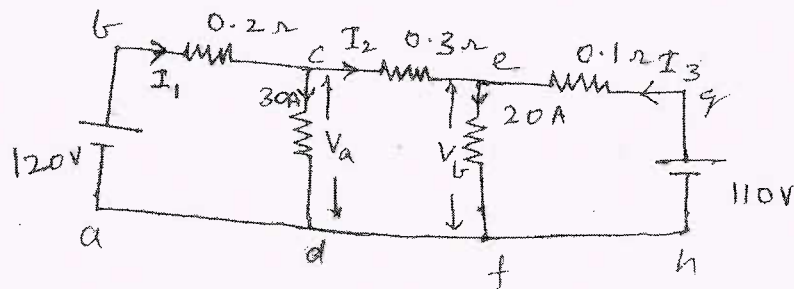


Fig.Q2(c)

(08 Marks)

### Module-2

- 3 a. With a neat sketch, explain the construction of the various parts of DC generator. (08 Marks)
- b. Explain with a neat diagram the constructional features and operation of an induction type single phase energy meter. (07 Marks)
- c. Explain the significance of back Emf in DC motor. (05 Marks)

**OR**

- 4 a. Derive the EMF equation of DC generator. (06 Marks)
- b. Describe with a neat sketch, the constructional details and working principle of a dynamometer type wattmeter. (06 Marks)
- c. A 4 pole, 100V shunt generator with lap connected armature, having field and armature resistance of  $50\Omega$  and  $0.1\Omega$  respectively. Supplies a load of sixty lamps. Each lamp rated 100V, 40W. Calculate the total armature current, the current per path and the generated emf. Allow a contact drop of 1 volt per brush. (08 Marks)

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

**Module-3**

- 5 a. Derive an expression for power in pure inductance circuit and draw voltage, current and power waveforms. (06 Marks)
- b. Draw and explain the wiring diagrams for the two-way control of lamp. (06 Marks)
- c. A choke coil takes a current of 2A lagging  $60^\circ$  behind the applied voltage of 200V at 50Hz. Calculate the resistance, inductance and impedance of the coil. Also determine the power consumed when it is connected across 100V, 25Hz supply. (08 Marks)

**OR**

- 6 a. Derive an expression for power in series resistance and inductance circuit and draw voltage and current waveform. (07 Marks)
- b. With a neat diagram, explain pipe earthing. (05 Marks)
- c. A voltage  $V = 100 \sin 314 t$  is applied to a circuit consisting of a  $25\Omega$  resistor and an  $80 \mu\text{F}$  capacitor in series. Determine :  
 i) Peak value of current  
 ii) Power factor  
 iii) Total power consumed by the circuit. (08 Marks)

**Module-4**

- 7 a. In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. (06 Marks)
- b. Show that the two wattmeters are sufficient to measure three phase power. Also derive an expression for the power factor in terms of wattmeter readings. (06 Marks)
- c. A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02wbs. The winding factor is 0.97 and pitch factor is 0.98. Calculate the phase emf and line emf. (08 Marks)

**OR**

- 8 a. Mention the advantages of three phase system over single phase system. (06 Marks)
- b. With neat sketches, explain the construction of salient pole alternator. (07 Marks)
- c. A balanced star connected load of  $(8 + j6)\Omega$  per phase is connected to a three phase, 230V supply. Find the line current, power factor, power and reactive voltampere and total voltampere. (07 Marks)

**Module-5**

- 9 a. Derive EMF equation of transformer. (07 Marks)
- b. Explain construction and working principle of a transformer with diagram. (07 Marks)
- c. The frequency of the emf in the stator of a 4 pole induction motor is 50Hz and in the rotor is 1.5Hz. What is the slip and at what speed is the motor running. (06 Marks)

**OR**

- 10 a. Derive the condition for which the efficiency of a transformer is maximum. (06 Marks)
- b. What is slip in an induction motor? Explain why slip is never zero in an induction motor. (06 Marks)
- c. The maximum efficiency at full load and unity pf of a single phase 25KVA, 50/1000V, 50Hz transformer is 98%, determine the efficiency at :  
 i) 75% load, 0.9pf    ii) 50% load, 0.9pf. (08 Marks)

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15ELE15/25

## First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 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. Deduce an expression for stored energy in a magnetic field. (04 Marks)  
 b. Find current in the battery, the current in each branch and pd across AB in the network shown in Fig.Q1(b). (06 Marks)

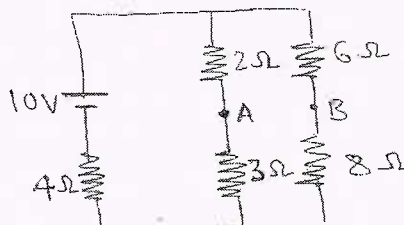


Fig.Q1(b)

- c. A coil of 1000 turns is wound on a silicon steel ring of relative permeability 1200. The ring has a mean diameter of 10cm and cross-sectional area of 12 sq.cm. When a current of 4 amperes flows through the coil. Find :
- i) Flux in the core
  - ii) Inductance of the coil
  - iii) The e.m.f included in the coil if the flux falls to zero in 15 milli seconds
  - iv) Now if another similar coil is placed such that 70% magnetic coupling exists between the coils. Find the mutual inductance. (06 Marks)

**OR**

- 2 a. State Fleming's right hand rule. Mention its application. (04 Marks)  
 b. A resistance of  $10\Omega$  is connected in series with the two resistances each of  $15\Omega$  arranged in parallel. What resistance must be shunted across this parallel combination so that the total current taken will be 1.5A from 20V supply applied? (06 Marks)  
 c. Coils A and B in magnetic circuit have 600 and 500 turns respectively. A current of 8A in coil A produces a flux of 0.04 Wb. If coefficient of coupling is 0.2, Calculate :
- i) Self inductance of coil A with B open circuited
  - ii) Flux linking with coil B
  - iii) The average e.m.f induced in coil B when the flux with it changes from zero to full value in 0.02 second
  - iv) Mutual inductance. (06 Marks)

### Module-2

- 3 a. With a neat sketch explain the construction of a DC machine. (06 Marks)  
 b. State the application of DC shunt motor and DC series motor. (04 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. The field resistance and armature resistance are  $110\Omega$ ,  $0.1\Omega$  respectively. The motor develops an output power of 6KW. The flux for pole is 40 MWb. Calculate :
- i) The speed
  - ii) The torque developed by the armature
  - iii) The shaft torque. (06 Marks)

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

OR

- 4 a. Explain different characteristics of a DC series motor. (05 Marks)  
 b. With the help of neat diagram, explain the construction and principle of operation of single phase energy meter. (06 Marks)  
 c. An 8 pole, Lap-connected armature has 40 slots with 12 conductors per slot, generates a voltage of 500V. Determine the speed at which it is running if the flux per pole is 50 MWb. (05 Marks)

Module-3

- 5 a. With a neat circuit diagram and a switching table, explain three way control of lamp. (04 Marks)  
 b. Derive an expression for RMS value of an alternating quantity. (06 Marks)  
 c. Two impedances of  $Z_1 = 10 + j15\Omega$  and  $Z_2 = 6 - j8\Omega$  are connected in parallel. If the supply current is 20A. What is the power dissipated in each branch? (06 Marks)

OR

- 6 a. Show that the average power consumed by pure inductor is zero. (05 Marks)  
 b. Explain the plate earthing along with a neat diagram. (06 Marks)  
 c. An alternating current of frequency of 60Hz has a maximum value of 12A  
 i) Write down the equations for its instantaneous value  
 ii) Find the value of current after  $\frac{1}{360}$  seconds  
 iii) Find the time taken to reach 9.6 Amps for the first time. (06 Marks)

Module-4

- 7 a. Obtain the relationship between line and phase values of current in a three phase balanced delta connected system. (05 Marks)  
 b. Discuss the different types of rotor used in alternator (07 Marks)  
 c. A 3 phase star connected system has  $4\Omega$  resistance in series with an inductance of 10mH per phase is applied voltage is 415V with frequency of 50 Hz. Find the power drawn by the circuit. (04 Marks)

OR

- 8 a. Derive e.m.f equation of an alternator. (05 Marks)  
 b. Three coils each of impedance  $20\angle 60^\circ$  are connected in star to a 3 phase, 400V, 50Hz supply. Find the reading on each of the two wattmeters connected to measure the power input. (05 Marks)  
 c. A 3-phase, 6-pole, star connected alternator revolves at 1000rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 Wb. Calculate voltage generated if  $k_w = 0.96$ . (06 Marks)

Module-5

- 9 a. Explain the principle of operation of a 3-phase induction motor. (05 Marks)  
 b. With a neat sketch explain the constructional details of core and shell type transformer. (06 Marks)  
 c. A 100 KVA, 6000/400V, 50Hz, single phase transformer has 100 turns in the secondary. Find : i) Full load primary current and secondary current ii) number of turns in the primary coil iii) maximum flux in the core. (05 Marks)

OR

- 10 a. A 6 pole induction motor is supplied by a 10 pole alternator which is driven at 600rpm. If the motor is running at 970 rpm, determine the percentage slip. (05 Marks)  
 b. Derive the expression for frequency of rotor currents. (04 Marks)  
 c. A 600 KVA transformer has an efficiency of 92% at full load, unity pf. and at half load, 0.9 pf. Determine its efficiency at 75% of full load and 0.9pf. (07 Marks)

\* \* \* 2 of 2 \* \* \*

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

Time: 3 hrs.

Max. Marks:100

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

**Module – 1**

- 1 a. State and explain Kirchoff's laws with example. (06 Marks)  
 b. In the given circuit shown in Fig Q1(b) : find the currents flowing in the various branches of the circuit. (06 Marks)

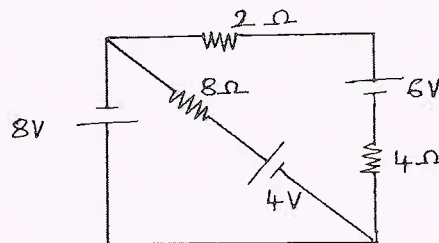


Fig Q1(b)

- c. Two identical coils of 1800 turns each, are placed side by side such that, 65% of the flux produced by one coil links the other. A current of 5A in the first coil sets up a flux of 0.12 mwb. If the current in the first coil changes from +5A to -5A, in 25msec. find:  
 (i) the self inductance of the coils (ii) The emf's induced in both the coils. (08 Marks)
- 2 a. Derive an expression for the energy stored in an inductive coil. (06 Marks)  
 b. Two voltmeters of resistances 15kΩ and 20kΩ are connected in series across 200V supply. Both meters are 0-300V range. Find the readings of the voltmeter. (04 Marks)  
 c. Calculate the approximate resistance and inductance of an air cored solenoid, 100cm long and 1cm in diameter. The coil is made of copper wire having 2000 turns, a resistivity of  $1.73 \times 10^{-2} \mu\Omega\text{-m}$  and a diameter of 1mm. Find the potential difference between the terminals of the solenoid, when a current of 2A is changing at the rate of 12,000A/sec. (07 Marks)  
 d. Find the resistance across SM of the network shown in Fig Q2(d). (03 Marks)

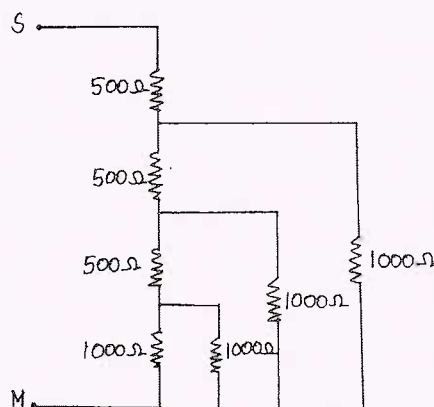


Fig Q2(d)



Module – 2

- 3 a. Derive the emf equation of a DC generator. (06 Marks)  
 b. Explain with a neat diagram, the constructional features and operation of dynamometer type wattmeter. (06 Marks)  
 c. Explain the working principle of operation of DC motor. (06 Marks)  
 d. Mention different types of armature windings and write one analogy between them. (02 Marks)
- 4 a. The armature of an 8 pole D.C generator has 960 conductors and runs at 400rpm. The flux per pole is 40mwb. Calculate the induced emf when the armature is lap wound. At what speed should it be driven to generate 400V, if the armature is wave connected. (06 Marks)  
 b. Sketch and explain the various characteristics of DC shunt motor and mention its applications. (08 Marks)  
 c. The field current in a DC shunt machine is 2A and the line current is 20A at 200V. Calculate (i) the generated emf when working as generator (ii) torque in N-m when running at 1500 rpm as motor. Take the armature resistance as  $0.5\Omega$  (06 Marks)

Module – 3

- 5 a. Define RMS value of an alternating quantity. Obtain the relation between rms value and the maximum value of an alternating quantity. (05 Marks)  
 b. With the help of neat sketch explain two way and three way control of lamps. (06 Marks)  
 c. A single phase voltage of 220V at 50Hz is applied to a circuit comprising of a resistance of  $20\Omega$ , inductance of 20mH and a capacitance of  $150\mu\text{F}$  connected in series. Find : (i) Impedance of the circuit (ii) Current drawn (iii) Power factor (iv) Power (v) Draw phasor diagram. (09 Marks)
- 6 a. Write a note on : (i) Electric shock (ii) Miniature Circuit Breaker (MCB). (06 Marks)  
 b. For a R-L-C series circuit discuss the nature of the p.f for (i)  $X_L > X_C$  (ii)  $X_L < X_C$  (iii)  $X_L = X_C$  with the help of phasor diagram. (06 Marks)  
 c. Two circuits A and B are connected in parallel across 200V, 50Hz supply. Circuit A consists of  $10\Omega$  resistance and 0.12H inductance in series while circuit B consists of  $20\Omega$  resistance in series with  $40\mu\text{F}$  capacitance. Calculate: (i) Current in circuit A and Circuit B (ii) Total current (iii) Total power. (08 Marks)

Module – 4

- 7 a. Obtain the relationship between line and phase voltage and current in a three phase balanced star connected system, with the help of neat vector diagram. (08 Marks)  
 b. State the advantages of rotating field over rotating armature in case of alternators. (06 Marks)  
 c. A 3 phase, 500 rpm, 6 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. Calculate, the flux/pole required to generate a line voltage of 2300V. Assume pitch factor  $K_c = 0.956$  and distribution factor  $K_d = 0.952$ . (06 Marks)
- 8 a. Show that two wattmeters are sufficient to measure three phase power for a 3 –  $\phi$  balanced circuit. (06 Marks)  
 b. A balanced three phase star connected load draws power from 440V supply. The two wattmeters connected indicate  $W_1 = 750$  Watts and  $W_2 = 1.5\text{KW}$ . Calculate power, power factor and current in the circuit. If the  $W_1$  wattmeter is reversed, what would be the phase angle between voltage and current? (08 Marks)  
 c. Explain construction of alternator with their main functions of the different parts and write working principle too in brief. (06 Marks)

**Module – 5**

- 9 a. Derive the emf equation of a transformer. (06 Marks)
- b. A single phase transformer working at 0.8 p.f. has an efficiency of 94% at both three fourth full load and full load of 600kW. Determine the efficiency at half full load, UPF. (06 Marks)
- c. Prove that a rotating magnetic field of constant magnitude is produced when the stator windings of polyphase induction motor are energized by a balanced three phase supply. (08 Marks)
- 10 a. Define efficiency of a transformer. Obtain the expression for efficiency at different loads and deduce the condition for maximum efficiency. (08 Marks)
- b. A 8 pole alternator runs at 750 rpm supplies power to 4 pole induction motor. The frequency of rotor is 1.5 Hz. What is the speed of the motor and slip of motor? (06 Marks)
- c. Explain why an induction motor needs starter. (03 Marks)
- d. What are the applications of three phase induction motor? (03 Marks)

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

## Constitution of India, Professional Ethics & Human Rights

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 40

### INSTRUCTIONS TO THE CANDIDATES

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

- 
1. The Indian constitution has the distinction of - - - - -  
a) the world's largest written constitution  
b) the world's smallest written constitution  
c) the best constitution in the world  
d) one of the oldest constitution in the world
  2. Which among the following was not a part of the original preamble of the constitution of India?  
a) sovereign                      b) Democratic                      c) secular                      d) republic
  3. How many categories of fundamental rights are guaranteed in part III of the constitution?  
a) 7                                      b) 5                                      c) 4                                      d) 6
  4. The Bijoe Emmanuel V/s State of Kerala (the National Anthem Case) was a case, where the supreme court of India interpreted the fundamental right, freedom to / of - - - - -  
a) assemble peacefully and without arms  
b) speech and expression  
c) move freely through the territory of India  
d) associations or unions
  5. Which among the following was the fundamental right added to the constitution by an amendment in 2002?  
a) right to freedom  
b) right to education  
c) freedom to assemble peacefully and without arms  
d) freedom to practice any profession





29. Fundamental duties were added to the constitution by the - - - - -  
 a) 44<sup>th</sup> Amendment Act of 1978                      b) 73rd Amendment Act of 1993  
 c) 77<sup>th</sup> Amendment Act of 1995                      d) 42nd Amendment Act of 1976
30. Indian constitution is - - - - -  
 a) rigid    b) flexible  
 c) partly rigid and partly flexible                      d) partly written and partly unwritten
31. One of the aims of studying engineering Ethics is to - - - - -  
 a) inspire engineers acquire in depth knowledge in the engineering field  
 b) stimulate moral imagination  
 c) acquire new skills in engineering testing  
 d) encourage research in engineering
32. The basis of or reference point for professional ethics is - - - - -  
 a) common morality    b) personal morality  
 c) business ethics    d) social morality
33. The skill and habit of thinking independently and rationally about ethical issues on the basis of moral concern is referred to as - - - - -  
 a) moral integrity    b) moral consistency  
 c) ethical awareness    d) moral autonomy
34. Which among the following is NOT an impediment to professional responsibility?  
 a) courage                      b) fear                      c) self-deception                      d) microscopic vision
35. Causing harm without aiming to cause harm but acting in conscious awareness that harm is likely to result is referred to as - - - - - causing harm  
 a) intentionally                      b) recklessly                      c) negligently                      d) inadvertently
36. The use of intellectual property of others without their permission or credit is - - - - -  
 a) trimming                      b) cooking                      c) plagiarism                      d) forging
37. Which among the following is not an attitude towards responsibility in engineering?  
 a) reasonable care                      b) good works                      c) minimalist                      d) idealistic
38. The question "What is 'safety' and how is it related to 'risk'?" is an example of - - - - - inquiry  
 a) conceptual                      b) factual                      c) normative                      d) descriptive
39. When one is in a professional relationship - - - - - is supposed to take precedence over personal morality  
 a) social morality                      b) common morality                      c) professional ethics                      d) religious morality
40. Which among the following are part of the umbrella virtue called professional responsibility?  
 a) self-direction virtues    b) public spirited virtues  
 c) teamwork virtues    d) all of these

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## First/Second Semester B.E. Degree Examination, June/July 2019 Engineering Physics

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Define SHM and mention any two examples. Derive the differential equation for SHM using Hooke's law. (07 Marks)
- b. With a neat diagram, explain the construction and working of Reddy's tube. Mention any three applications of shock waves. (09 Marks)
- c. For a particle executing SHM, its acceleration is found to be  $15\text{cm/s}^2$  when it is at 3cm from its mean position. Calculate time period. (04 Marks)

OR

- 2 a. Explain the basics of conservation of mass, momentum and energy. (06 Marks)
- b. What are forced oscillations? Derive the expressions for steady state amplitude and phase angle in case of forced oscillations. (10 Marks)
- c. A 20g oscillator with natural angular frequency  $10\text{rads}^{-1}$  is vibrating in damping medium. The damping force is proportional to the velocity of the vibrator. Calculate the value of damping required for the oscillations to be critically damped. (Given damping coefficient is 0.17). (04 Marks)

### Module-2

- 3 a. State and explain Hooke's law. Explain the nature of elasticity with the help of stress-strain diagram. (08 Marks)
- b. Define bending moment. Derive the expression for bending moment interms of moment of inertia. (08 Marks)
- c. Calculate the torque required to twist a wire of length 1.5m, radius  $0.0425 \times 10^{-2}\text{m}$ . through an angle  $\left(\frac{\pi}{45}\right)$  radian, if the value of rigidity modulus of its material is  $8.3 \times 10^{10}\text{N/m}^2$ . (04 Marks)

OR

- 4 a. Define Poisson's ratio. Obtain the relation between  $y$ ,  $n$  and  $\sigma$  where the symbols have their usual meaning. (08 Marks)
- b. What are Torsional Oscillations? Mention any two applications of Torsional Pendulum. Derive the expression for couple per unit twist of a solid cylinder. (08 Marks)
- c. Calculate the force required to produce an extension of 1mm in steel wire of length 2m and diameter 1mm (Young's modulus for steel  $Y = 2 \times 10^{11}\text{N/m}^2$ ). (04 Marks)

### Module-3

- 5 a. State and prove Gauss Divergence Theorem. (08 Marks)
- b. Define fractional Index change ( $\Delta$ ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber. (08 Marks)

- c. A circular coil of radius 10cm having 50 turns carries a current of 5A. Determine the magnetic field produced by the coil at a distance of 3cm from the centre. Also determine magnetic field produced by the coil at its centre. (04 Marks)

OR

- 6 a. Derive wave equation in terms of electric field using Maxwell's equations for free space. (08 Marks)
- b. Describe different types of optical fibers with neat diagrams. Mention any two mechanisms involved in fiber loss. (08 Marks)
- c. Calculate the V-number for a fiber of core-diameter 40 $\mu$ m and with refractive indices of 1.55 and 1.5 respectively for core and cladding. When the wavelength of the propagating wave is 1400nm. Also calculate the number of modes that the fiber can support for propagation. Assume that the fiber is in air. (04 Marks)

Module-4

- 7 a. Starting from Schrodinger's time independent wave equation, derive the expression for energy eigen value and eigen function for an electron in one dimensional potential well of infinite height. (10 Marks)
- b. Explain the construction and working of CO<sub>2</sub> LASER with the help of energy level diagram. (06 Marks)
- c. The average output power of laser source emitting a laser beam of wavelength 632.8nm. Find the number of photons emitted per second by the laser source. (04 Marks)

OR

- 8 a. Define the terms population inversion and meta-stable state. Derive the expression for energy density of radiation at equilibrium interms of Einstein's coefficients. (10 Marks)
- b. Using Heisenberg's uncertainty principle, show that electrons do not reside inside the nucleus. (06 Marks)
- c. An electron is bound in an 1-D potential well of infinite height and of width 1 Å. Calculate its energy values in the ground state and also in the first two excited states. (04 Marks)

Module-5

- 9 a. Define Fermi energy. Explain the variation of Fermi factor with temperature. (08 Marks)
- b. What is Hall effect? Obtain the expression for Hall coefficient, and express Hall voltage interms of Hall coefficient. (08 Marks)
- c. The dielectric constant of sulphur is 3.4. Assuming a cubic lattice for its structure, calculate the electronic polarizability of sulphur (given, density of sulphur = 2.07 g/cc and atomic weight = 32.07). (04 Marks)

OR

- 10 a. Mention the assumptions of Quantum free electron theory. Discuss two success of quantum free electron theory. (08 Marks)
- b. Define the term internal field in case of solid dielectrics with one-dimensional equation. Explain polar and non-polar dielectrics with examples. (08 Marks)
- c. The intrinsic charge carrier concentration of germanium is  $2.4 \times 10^{19}/m^3$ . calculate its resistivity if mobility of electrons and holes respectively are 0.39m<sup>2</sup>/vs and 0.19m<sup>2</sup>/vs. (04 Marks)

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17PHY12/22

## First/Second Semester B.E. Degree Examination, June/July 2019 Engineering Physics

Time: 3 hrs.

Max. Marks: 100

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

*2. Physical Constants : Velocity of light,  $c = 3 \times 10^8 \text{ ms}^{-1}$*

*Mass of electron,  $m_e = 9.1 \times 10^{-31} \text{ kg}$*

*Boltzmann constant,  $K_B = 1.38 \times 10^{-23} \text{ J/k}$*

*Charge of an electron,  $e = 1.6 \times 10^{-19} \text{ C}$*

*Avagadro number,  $N_A = 6.02 \times 10^{26} / \text{k mole}$*

### Module-1

- 1 a. What is ultraviolet catastrophe? Discuss in brief Wien's law and Rayleigh-Jeans law to explain blackbody radiation. (06 Marks)
- b. Solve the Schrodinger's wave equation for the allowed energy values in the case of particle in a box and also find eigen function for the same and represent with figure. (10 Marks)
- c. Calculate the wavelength associated with an electron having a kinetic energy of 100 eV. (04 Marks)

OR

- 2 a. Define group velocity and phase velocity. Derive the relation between the two. (06 Marks)
- b. Mention the properties of the wave function. Set up time-independent one-dimensional Schrodinger's equation. (10 Marks)
- c. In a measurement that involved a maximum uncertainty of 0.003%, the speed of an electron was found to be  $800 \text{ ms}^{-1}$ . Calculate the corresponding uncertainty involved in determining its position. (04 Marks)

### Module-2

- 3 a. Define the following terms: (i) Drift velocity (ii) Relaxation time. Discuss the drawbacks of classical free electron theory in metals. (08 Marks)
- b. Define critical magnetic field. Explain types of super conductors. Mention applications of super conductors. (08 Marks)
- c. The effective mass of an electron in Silicon (Si) is  $0.31 m_0$ , where  $m_0$  is free electron mass. Find the electron concentration for Si at 300 K, assuming that Fermi level lies exactly in the middle of energy gap. Given energy gap of Si = 1.1 eV. (04 Marks)

OR

- 4 a. Briefly explain Fermi-Dirac statistics and discuss the dependence of Fermi-factor on temperature. (06 Marks)
- b. State and explain Meissner effect. (05 Marks)
- c. Explain BCS theory for superconductivity. (05 Marks)
- d. The resistivity of intrinsic Silicon at  $27^\circ\text{C}$  is  $3000 \Omega\text{m}$ . Assuming electron and hole mobilities of  $0.17 \text{ m}^2\text{V}^{-1}\text{S}^{-1}$  and  $0.035 \text{ m}^2\text{V}^{-1}\text{S}^{-1}$  respectively. Calculate intrinsic carrier concentration. (04 Marks)

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

**Module-3**

- 5 a. Explain construction and working of semiconductor laser with the help of energy band diagram. (07 Marks)
- b. Describe recording and reconstruction process in holography with the help of suitable diagram. Mention its applications. (09 Marks)
- c. A medium in thermal equilibrium at temperature 300K has two energy levels with a wavelength separation of 1  $\mu\text{m}$ . Find the ratio of population densities of the upper and lower levels. (04 Marks)

**OR**

- 6 a. Obtain an expression for energy density of radiation under equilibrium condition in term of Einstein's coefficients. (06 Marks)
- b. Discuss types of optical fibers using suitable diagrams. (06 Marks)
- c. Explain point to point communication system using optical fiber with block diagram. (04 Marks)
- d. The attenuation of light in an optical fibre is estimated as 2.2 dB/km. What fractional initial intensity remains after 2 km and 6 km? (04 Marks)

**Module-4**

- 7 a. What are Miller Indices? Show that for cubic the distance between two successive plane (h k l) is given by  $d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$ . (07 Marks)
- b. Define coordination number, atomic radius and atomic packing factor. Find atomic packing factor for SC, BCC and FCC. (09 Marks)
- c. X-rays of wavelength 1.541  $\text{\AA}$  are diffracted by (1 1 1) planes in a crystal at an angle of 30° in the first order. Calculate the inter atomic spacing. (04 Marks)

**OR**

- 8 a. Explain the procedure followed to specify crystal planes using Miller indices with an example. (05 Marks)
- b. State and explain Bragg's law. Describe how Bragg's spectrometer is used to determine the wavelength of an x-ray beam. (10 Marks)
- c. Draw following planes in cubic unit cell (100) (110) (011) (111) (001). (05 Marks)

**Module-5**

- 9 a. Explain the construction and working of scanning electron microscope. Mention its applications. (10 Marks)
- b. Explain Ball-Milling method of synthesis of nanomaterials. (06 Marks)
- c. Write any four applications of carbon nano tube. (04 Marks)

**OR**

- 10 a. Explain top-down and bottom-up approach in synthesis of nano-materials. (06 Marks)
- b. Explain the construction and working of Reddy's shock tube. (06 Marks)
- c. Describe the various quantum structures. (08 Marks)

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15PHY12/22

## First/Second Semester B.E. Degree Examination, June/July 2019 Engineering Physics

Time: 3 hrs.

Max. Marks: 80

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

- 2. Physical Constants:** Velocity of light,  $C = 3 \times 10^8$  m/S,  
 Plank's constant  $h = 6.625 \times 10^{-34}$  JS;  
 Mass of electron  $m = 9.1 \times 10^{-31}$  kg,  
 Boltzmann constant  $K = 1.38 \times 10^{-23}$  J/K,  
 Avagadro number,  $N_A = 6.02 \times 10^{26}$  /Kmole,  
 Charge of electron  $e = 1.6 \times 10^{-19}$  C

### Module-1

- 1**
- a. Write Planck's radiation law. Show how one can arrive at Wien's law and Rayleigh-Jeans law from Planck's law. (06 Marks)
  - b. Set up time-independent one dimensional Schrodinger's wave equation. (06 Marks)
  - c. A particle of mass  $0.5 \text{ MeV}/C^2$  has kinetic energy 100 eV. Find its de Broglie wavelength. where C is the velocity of light. (04 Marks)

**OR**

- 2**
- a. State Heisenberg's uncertainty principle. Prove that electron does not exists inside the nucleus. (07 Marks)
  - b. Define phase velocity and group velocity. Obtain the relation between group velocity and particle velocity. (05 Marks)
  - c. A spectral line of wavelength  $5461 \text{ \AA}$  has a width of  $10^{-4} \text{ \AA}$ . Evaluate the minimum time spent by the electrons in the upper energy state. (04 Marks)

### Module-2

- 3**
- a. Explain failures of classical free electron theory. (06 Marks)
  - b. What is meant by critical field in the case of super conductors. Explain Type I and Type II super conductors. (06 Marks)
  - c. Calculate the probability of an electron occupying an energy level 0.02 eV above and below the Fermi level at 200 K. (04 Marks)

**OR**

- 4**
- a. Define Fermi factor. Discuss the variation of Fermi factor with temperature and energy. (07 Marks)
  - b. Explain BCS theory of super conductivity. (05 Marks)
  - c. The resistivity of intrinsic germanium at  $27^\circ\text{C}$  is equal to 0.47 ohm-meter. Assuming electron and hole mobilities as 0.38 and  $0.18 \text{ m}^2\text{V}^{-1}\text{S}^{-1}$  respectively. Calculate the intrinsic carrier density. (04 Marks)

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

Module-3

- 5 a. Explain the construction and working of semiconductor laser. (06 Marks)  
 b. What is attenuation? Explain the various mechanisms through which attenuation takes place. (07 Marks)  
 c. An optical fiber has a core material with refractive index of 1.55 and cladding refractive index of 1.50. The light is launched into it in air. Calculate its numerical aperture and the acceptance angle. (03 Marks)

OR

- 6 a. Describe the recording and reconstruction process in holography with the help of suitable diagrams. (06 Marks)  
 b. Describe different types of optical fiber, along with the typical core and cladding diameter, refractive index profile and mode of propagation sketches. (06 Marks)  
 c. The ratio of population of two energy levels is  $1.059 \times 10^{-30}$ . Find the wavelength of light emitted at 330 K. (04 Marks)

Module-4

- 7 a. Define Miller indices. Derive an expression for interplanar spacing in terms of Miller indices. (05 Marks)  
 b. Explain the crystal structure of diamond. Show that packing factor for diamond is  $\frac{\sqrt{3}}{16} \pi$ . (05 Marks)  
 c. Describe the construction and working of Bragg's spectrometer. (06 Marks)

OR

- 8 a. Obtain the relation between atomic radius and the lattice constant in the case of BCC structure. Also find the atomic packing factor in the case of simple cubic and face centered cubic system. (06 Marks)  
 b. Explain unit cell and lattice parameters. Draw the crystal plane  $(\bar{1} \ 3 \ 2)$  in a cubic unit cell. (06 Marks)  
 c. A monochromatic X-ray beam of wavelength  $0.7 \text{ \AA}$  undergoes first order Bragg reflection from the plane (3 0 2) of a cubic crystal at a glancing angle of  $35^\circ$ . Calculate the lattice constant. (04 Marks)

Module-5

- 9 a. Explain the construction and working of Reddy shock tube. Mention any one characteristics of Reddy tube. (06 Marks)  
 b. Write note on Ball milling method of preparation of nano materials. (04 Marks)  
 c. Explain the conservation of mass, momentum and energy with respect to shock wave. (06 Marks)

OR

- 10 a. Explain three different structures of carbon nano tube. Write any one properties of carbon nano tube. (07 Marks)  
 b. Define Mach number. Explain subsonic and supersonic waves. (05 Marks)  
 c. Describe the arc discharge method of preparing carbon nano tubes. (04 Marks)

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Question Paper Version : B

**Third/Fourth Semester B.E. Degree Examination, June/July 2019**  
**Constitution of India, Professional Ethics & Human Rights**  
**(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 30

### INSTRUCTIONS TO THE CANDIDATES

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

- 
1. It is not a kind of trademark:  
a) Designs  
b) Sounds  
c) Symbols  
d) Good will
  2. These are not trade secrets  
a) Formulas  
b) Principles  
c) Devices  
d) None of these
  3. Stealing of intellectual property means  
a) Cooking  
b) Forging  
c) Plagiarism  
d) Symbols
  4. Cooking means  
a) Boiling under pressure  
b) Making deceptive statements  
c) Retaining results with fit the theory  
d) Misleading the public about the quality of a product.
  5. This is not dishonesty in engineering  
a) Forging  
b) Blending  
c) Trimming  
d) Cooking

-BI-

6. One of the ways of reducing the risk is  
a) Complex interaction  
b) Tight coupling  
c) Normalization of deviance  
d) Changing the working system.
7. Which of the following statement is incorrect regarding budget?  
a) The term 'Budget' is not explicitly stated in Indian Constitution  
b) The Budget can be introduced in Lok Sabha only  
c) The introduction of budget required recommendation of the President  
d) The Budget is passed like an ordinary bill in the parliament.
8. The power of the Supreme Court of India to decide disputes between the Centre and the States falls under its;  
a) Advisory jurisdiction  
b) Appellate jurisdiction  
c) Original jurisdiction  
d) Constitutional jurisdiction
9. The power to increase the number of judges in the Supreme Court of India is vested in;  
a) The President of India  
b) The Parliament  
c) The Chief Justice of India  
d) The Law Commission.
10. There is a Parliamentary System of Government in India because the  
a) Lok Sabha is elected directly by the people  
b) Parliament can amend the Constitution  
c) Rajya Sabha cannot be dissolved  
d) Council of Ministers is responsible to the Lok Sabha
11. Appointment, posting and promotion of district judge in a state are made by the  
a) Governor in consultation with the High Court  
b) Chief Justice of the High Court of that state in consultation with the Governor  
c) President in consultation with the High Court  
d) President in consultation with the Governor and the High Court.
12. Notifications in respect of by-elections to the Lok Sabha are issued by the  
a) Election commission  
b) Speaker of Lok Sabha  
c) The Whip  
d) No notification is required for by-election.
13. With reference to 'None of the Above (NOTA)' option on electronic voting machines and ballot papers, consider the following statements :  
I) The Citizens of India have the right to negative vote by exercising the 'None of the Above' option in EVMs and ballot papers.  
II) If NOTA gets the highest votes in an election, then the election is conducted again.  
a) I only  
b) I and II  
c) II only  
d) None of these

14. With reference to 73<sup>rd</sup> Amendment Act of the constitution, a Grama Sabha is a body consisting of
- All the adult population of the Village under the Panchayat
  - The whole population of the villages under the Panchayat other than children less than five years of age.
  - The registered voters of the villages under the Panchayat
  - None of the above.
15. Which of the following is not taken as the aim of engineering ethics?
- Moral imagination
  - Recognition of ethical issues
  - Sense of responsibility
  - Shifting of responsibility
16. Which of the following is not a concept of responsibility?
- Minimalist
  - Maximalist
  - Reasonable care
  - Good works
17. Corrupt Professional Judgment leads to
- Integrity in R&D
  - Reliability
  - Conflict of interest
  - None of these
18. The formulate of a soft drink is an example of
- Copy Right
  - Trade Secret
  - Patent
  - Trade Marks
19. The 9<sup>th</sup> schedule to the Indian Constitution was added by;
- 1<sup>st</sup> Amendment
  - 8<sup>th</sup> Amendment
  - 9<sup>th</sup> Amendment
  - 42<sup>nd</sup> Amendment
20. Which one of the following Articles of the directive principles of state policy deals with the promotion of international peace and security?
- 51
  - 48A
  - 43A
  - 41
21. The ideal of 'Welfare state' in the Indian Constitution is enshrined in its ;
- Preamble
  - Directive Principles of State Policy
  - Fundamental rights
  - 7<sup>th</sup> Schedule
22. For a citizen of India, the duty to pay taxes is a ;
- Fundamental duty
  - Legal obligation
  - Constitutional obligation
  - Moral obligation
23. Which of the following statements regarding the pardoning Powers of the President is incorrect?
- Pardoning power of the president is restricted.
  - President can completely pardon any sentence
  - The power to pardon is the discretionary power of President
  - None of these.

24. Which one of the following is responsible for the preparation and presentation of union budget of the parliament?  
a) Department of Revenue                      b) Department of Economic Affairs  
c) Department of Expenditure                d) None of these
25. The members of the Constituent Assembly which drafted the constitution of India were,  
a) Nominated by the British parliament  
b) Nominated by the Governor General  
c) Elected by the Legislative Assemblies of various provinces  
d) Elected by the Indian National Congress and Muslim league.
26. Which one of the following determines that the Indian constitution is federal?  
a) A written and rigid constitution  
b) An independent judiciary  
c) Vesting of residuary powers with the centre  
d) Distribution of powers between the centre and the state.
27. The Indian parliamentary system is different from the British parliamentary system in which of the following respects?  
a) Both a real and a nominal executive      b) A system of collective responsibility  
c) Bicameral legislature                        d) A different judicial review
28. Which one of the following objectives is not embodied in the Preamble to the Constitution of India?  
a) Liberty of thought                              b) Economic liberty  
c) Liberty of expression                         d) Liberty of belief
29. The mind of the makers of the Constitution of India is reflected in which of the following?  
a) The Preamble  
b) The Fundamental Rights  
c) The Directive Principles of State policy  
d) The fundamental duties.
30. Which one of the following rights was described by Dr. B.R. Ambedkar as the heart and soul of the Constitution?  
a) Right to freedom of religion                b) Right to property  
c) Right to equality                                d) Right to constitutional remedies.

\* \* \* \* \*



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**First/Second Semester B.E Degree Examination, June/July 2019**  
**Constitution of India, Professional Ethics and Human Rights**

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 40

**INSTRUCTIONS TO THE CANDIDATES**

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

1. The date of commencement of Indian Constitution is  
a) 26-01-1950                      b) 26-11-1949                      c) 15-08-1947                      d) 14-08-1947
2. In the final form of the constitution adopted by the constituent assembly, how many articles and schedules were there?  
a) 395 Articles and 8 Schedules                      b) 398 Articles and 7 Schedules  
c) 319 Articles and 8 Schedules                      d) 365 Articles and 7 Schedules
3. The preamble of the constitution of India has been amended so for  
a) Four times                      b) Thrice                      c) Twice                      d) Once
4. The preamble was amended by  
a) 24<sup>th</sup> amendment                      b) 42<sup>nd</sup> amendment                      c) 44<sup>th</sup> amendment                      d) 76<sup>th</sup> amendment
5. A state which does not promote or interfere in the affairs of religion is referred to as  
a) Secular                      b) Democratic                      c) Socialist                      d) Liberal
6. Universal adult franchise shows that India is a country which is  
a) Democratic                      b) Secular                      c) Socialist                      d) Sovereign
7. The first temporary 2-day president of the constituent assembly was  
a) Rajendra Prasad                      b) BR Ambedkar  
c) Sachidananda Sinha                      d) Shyamaprasad Mukharjee

8. Terminology for the preamble was taken from the constitution of  
 a) UK                                      b) Canada                                      c) Australia                                      d) Ireland
9. The fundamental rights are enshrined in chapter  
 a) III                                      b) II                                      c) I                                      d) IV
10. Directive principles of state policies are  
 a) political rights                      b) Constitutional rights                      c) Legal rights                      d) Social rights
11. This is not a fundamental duty  
 a) To develop scientific temper                      b) To protect environment  
 c) Involving in corruption                      d) To abide by the constitution
12. The directive principles incorporated in the constitution have been inspired by the constitution of  
 a) USA                                      b) Ireland                                      c) Canada                                      d) Australia
13. Uniform Civil code means  
 a) Codified law applicable to all persons of India irrespective of religion  
 b) Civil law applicable to common man  
 c) Common law applicable to government servants  
 d) Common law applicable to Hindus and Muslims
14. What can be the maximum gap between two sessions of parliament?  
 a) Four months                      b) Six months                      c) 1 year                      d) 2 months
15. The president of India is elected for  
 a) 3 years                      b) 5 years                      c) 6 years                      d) 4 years
16. What is the term of Rajyasabha members?  
 a) 3 years                      b) 4 years                      c) 5 years                      d) 6 years
17. Present Chief Justice of India is  
 a) RM Lodha                      b) T.S. Thakur                      c) H L Dattu                      d) P Sathasivam
18. What is the system of legislature in the state of Karnataka?  
 a) Cameral                      b) Unicameral                      c) Bicameral                      d) None
19. Who appoints Vice-Chancellors of the State Universities?  
 a) Chief Minister                      b) Education Minister  
 c) Governor                      d) Chief Justice of High Court
20. On what ground, a judge of High Court can be removed  
 a) Insolvency                      b) Insanity  
 c) Public demand                      d) Proved misbehaviour or incapacity
21. In India, the citizens have been given the right to vote on the basis of  
 a) Age                      b) Gender                      c) Education                      d) Employment



36. Which of the following does not depict the attitude towards responsibility?  
a) Good works      b) Protest      c) Minimalist      d) Reasonable care
37. The smoothing of irregularities to make data to look extremely precise done researches called  
a) Forging      b) Plagiarism      c) Trimming      d) Cooking
38. Which of the following is not preserved as an intellectual property?  
a) Patterns      b) Copy Rights  
c) Government Regulations      d) Trade Secrets
39. Corrupt professional judgment leads to  
a) Reliability      b) Integrity      c) Conflict of interest      d) None of these
40. One of the ways of reducing the risk is  
a) Complex interaction      b) Changing the working system  
c) Normalization of deviance      d) Tight coupling

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18CIV14/24

## First/Second Semester B.E. Degree Examination, June/July 2019 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. Assume missing data suitably.*

### Module-1

1. a. Briefly explain the role of civil engineers in the infrastructure development of the country. (06 Marks)
- b. Explain briefly the scope of civil engineering in (i) structural engineering (ii) geotechnical engineering. (08 Marks)
- c. A 200 N vertical force is applied to the end of the lever which is attached to a shaft as shown in Fig.Q1(c). Determine: (i) Moment of force about 'O' (ii) Horizontal force applied at 'A' which creates same moment about 'O' (iii) Minimum force which creates the same moment about 'O'.

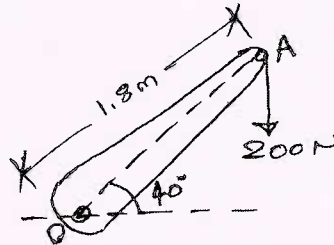


Fig.Q1(c)

(06 Marks)

OR

2. a. Determine the resultant of the force system acting on a body as shown in the Fig.Q2(a) with respect to point 'O'.

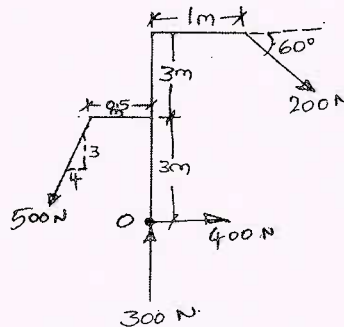


Fig.Q2(a)

(08 Marks)

- b. State and prove Varignon's theorem of moments. (06 Marks)
- c. 2 kN force is the resultant of a system of forces acting along positive y-axis as shown in Fig.Q2(c). Determine the value of F and  $\theta$ .

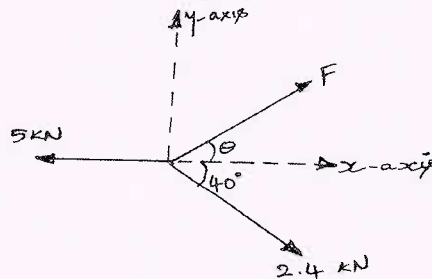


Fig.Q2(c)

(06 Marks)

1 of 3

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

**Module-2**

- 3 a. What is meant by equilibrium? State the conditions of static equilibrium for both coplanar concurrent and non-concurrent force system. (05 Marks)  
 b. State and prove Lami's theorem. (05 Marks)  
 c. Determine the force 'P' required to cause the motion of the blocks to impend. Take the weight of A as 90 N and weight of B as 50 N. Take coefficient of friction for all contact surfaces as 0.30 as shown in Fig.Q3(c) and consider the pulley being frictionless.

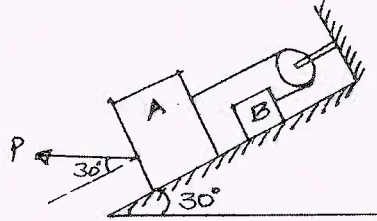


Fig.Q3(c)

(10 Marks)

**OR**

- 4 a. Briefly explain: (i) Angle of friction (ii) Cone of friction. (04 Marks)  
 b. Calculate the tension in the strings. Also calculate 'θ' in Fig.Q4(b).

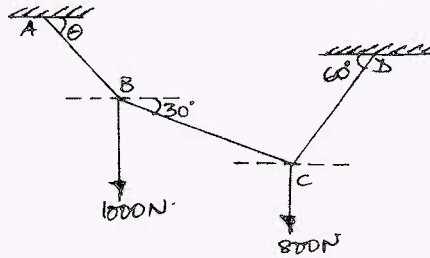


Fig.Q4(b)

(10 Marks)

- c. Prove that angle of repose is equal to angle of friction. (06 Marks)

**Module-3**

- 5 a. What are the different types of beams? How do you differentiate them? (06 Marks)  
 b. List the steps followed in the analysis of truss by method of joints. (06 Marks)  
 c. Find the length 'X' so that the reactions at both the supports are equal for the beam as shown in Fig.Q5(c).

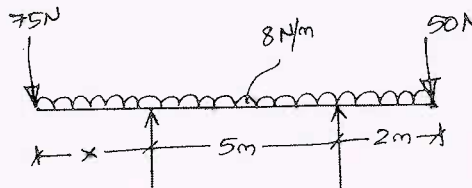


Fig.Q5(c)

(08 Marks)

**OR**

- 6 a. List the assumptions made in the analysis of trusses. (04 Marks)  
 b. What are the different types of supports and mark their reaction lines. (06 Marks)  
 c. Analyze the frame and tabulate the member forces for the frame shown in Fig.Q6(c).

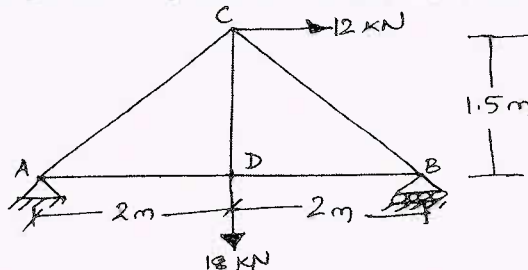


Fig.Q6(c)

(10 Marks)

**Module-4**

- 7 a. Derive an expression for the centroid of a right angles triangle. (06 Marks)  
 b. State and prove perpendicular axis theorem. (04 Marks)  
 c. Determine the polar radius of gyration for the built up section as shown in Fig.Q7(c).

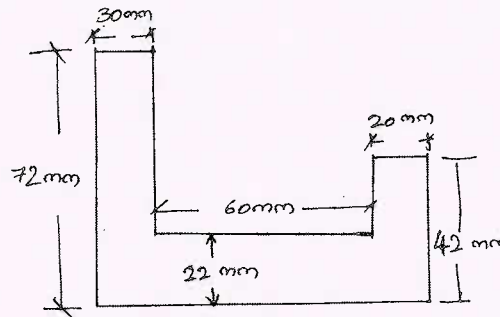


Fig.Q7(c) (10 Marks)

**OR**

- 8 a. Determine the moment of inertia of a semicircle with respect to its diameter line and hence determine the moment of inertia with respect to its centroidal axis parallel to the diameter line. Also write the expression for moment of inertia with respect to a line perpendicular to the diameter passing through the centroid. (12 Marks)  
 b. Determine the position of the centroid for the Fig.Q8(b).

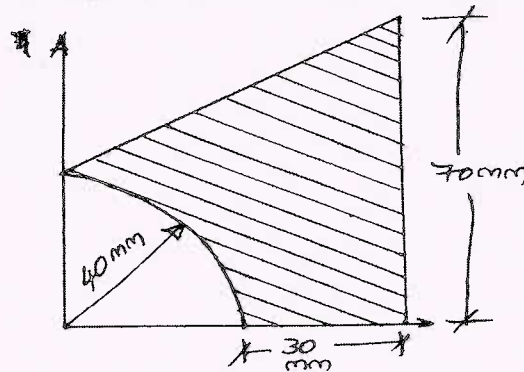


Fig.Q8(b) (08 Marks)

**Module-5**

- 9 a. Define displacement, distance travelled, velocity and acceleration. Mention their respective S.I units. (04 Marks)  
 b. Acceleration of a particle is given by  $a = -2 \text{ m/s}^2$ . If  $v = 8 \text{ m/s}$  and  $x = 0$  when  $t = 0$ . Determine: (i) velocity (ii) total distance travelled when  $t = 6 \text{ sec}$ . (08 Marks)  
 c. State D'Alembert's principle and mention its application in plane motion. (08 Marks)

**OR**

- 10 a. Derive the equations of motion. (08 Marks)  
 b. What is superelevation? Why is it necessary? (04 Marks)  
 c. An aircraft moving horizontally at a speed of 300 km/hr at an elevation of 2.5 km targets a point on the ground and releases a bomb. If the bomb has to hit the target, determine the horizontal distance at which the aircraft should release the bomb. Also calculate the velocity and direction with which the bomb will hit the target. (08 Marks)

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17CIV13/23

## First/Second Semester B.E. Degree Examination, June/July 2019 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. Assume any missing data suitably.*

### Module-1

- 1 a. Explain briefly :
  - (i) Transportation Engineering
  - (ii) Structural Engineering
  - (iii) Environmental Engineering
  - (iv) Geotechnical Engineering
  - (v) Water resources and Irrigation Engineering (10 Marks)
- b. Explain (i) types of Bridge and Culverts with simple sketches (ii) Types of dams based on material, structural behaviour and functionality with simple sketches. (10 Marks)

OR

- 2 a. Explain
  - (i) Static and Dynamic
  - (ii) Kinematics and Kinetics
  - (iii) Couple and Moment
  - (iv) Force and its characteristics
  - (v) Transmissibility of forces (10 Marks)
- b. Find the moment of 500 N force about the point A, B, C and D as shown in Fig.Q2(b).

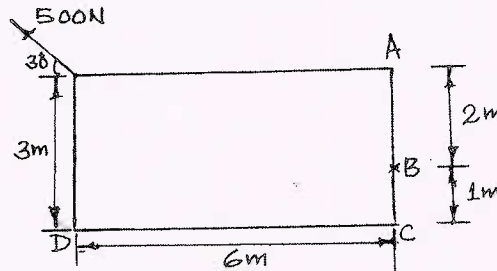


Fig.Q2(b)

(10 Marks)

### Module-2

- 3 a. State and prove Lami's theorem. (04 Marks)
- b. Find the resultant of coplanar concurrent forces shown in Fig.Q3(b). (08 Marks)

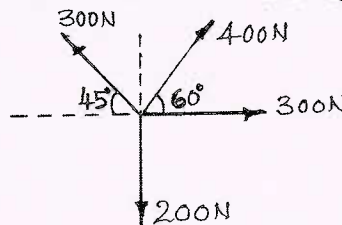


Fig.Q3(b)

- c. State and prove parallelogram law of forces. (08 Marks)

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



OR

- 4 a. Explain  
 (i) Limiting friction (ii) Angle of friction (iii) Angle of repose (iv) Coefficient of friction  
 (08 Marks)
- b. Two blocks A and B weighing 2 kN and 1.5 kN are connected by a wire passing over a smooth frictionless pulley as shown in Fig.Q4(b). Determine the magnitude of force P required to impend the motion taking  $\mu = 0.2$   
 (12 Marks)

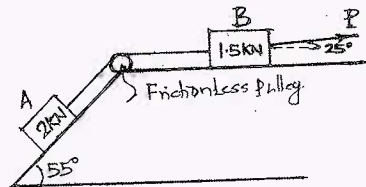


Fig.Q4(b)

Module-3

- 5 a. State and prove Varignon's theorem. (06 Marks)
- b. Two spheres each of radius 100mm and weight 5 kN is in a rectangular box as shown in Fig.Q5(b). Calculate the reactions at all the points of contact. (14 Marks)

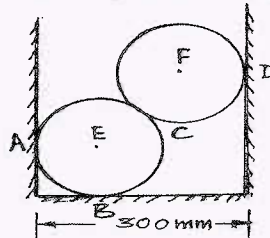


Fig.Q5(b)

OR

- 6 a. Explain the different types of supports with sketches. (06 Marks)
- b. A beam ABCDE has a flexible link BC as shown in Fig.Q6(b). Determine the support reactions at A, D and E. (14 Marks)

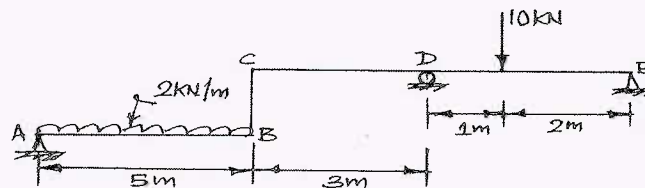


Fig.Q6(b)

Module-4

- 7 a. State and prove parallel axis theorem. (06 Marks)
- b. Find the centroid of the shaded area shown in Fig.Q7(b), obtained by cutting a semicircle of diameter 100mm from the Quadrant of a circle of radius 100 mm. (14 Marks)

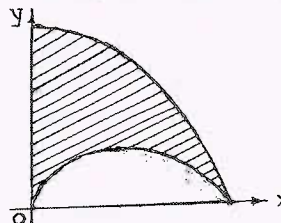


Fig.Q7(b)

OR

- 8 a. Explain the following (i) Centre of gravity (ii) Centroid (iii) Axis of symmetry. (06 Marks)  
 b. Determine the moment of inertia and radii of Gyration of the area shown in Fig.Q8(b) about the base AB and the centroidal axis parallel to AB. (14 Marks)

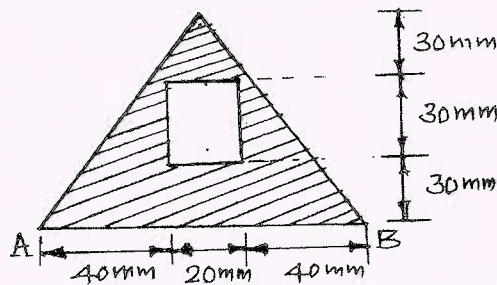


Fig.Q8(b)

Module-5

- 9 a. A stone is thrown upward with a velocity of 40 m/sec. Determine the time of the stone when it is at a height of 10m and is moving downwards. (10 Marks)  
 b. Two stones A and B are projected from the same point at inclination of  $45^\circ$  and  $30^\circ$  respectively to the horizontal. Find the ratio of the velocities of projection of A and B if the maximum height reached by them is the same. (10 Marks)

OR

- 10 a. A highway curve of 250m radius is banked for a speed of 45 kmph. Determine the amount of super elevation if the width of the road is 16m. (06 Marks)  
 b. An elevator being lowered into a mine shaft starts from rest and attains a speed of 10 m/sec with in a distance of 15m. The elevator alone has a mass of 500 kg and it carries a box of mass 600kg is it. Find the total tension in the cables supporting the elevator, during the accelerated motion. Also find the total pressure between the box and the floor of the elevator. (14 Marks)

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# CBCS SCHEME

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15CIV13/23

## First/Second Semester B.E. Degree Examination, June/July 2019 Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Briefly explain the scope of any four fields of civil engineering. (08 Marks)
- b. Replace the force couple system by a single force with respect to AB and CD shown in Fig.Q.1(b). (08 Marks)

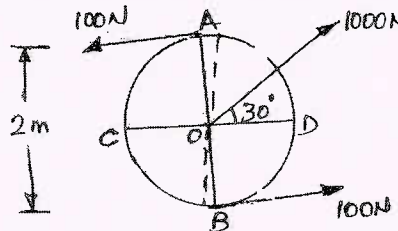


Fig.Q.1(b)

**OR**

- 2 a. Draw typical cross section of road and explain its components. (08 Marks)
- b. Briefly explain:
  - i) Rigid body
  - ii) Principle of transmissibility of force
  - iii) Force and its characteristics
  - iv) Couple and its characteristics. (08 Marks)

### Module-2

- 3 a. State and prove Lamis theorem. (08 Marks)
- b. Determine the resultant of forces which are acting as shown in Fig.Q.3(b). (08 Marks)

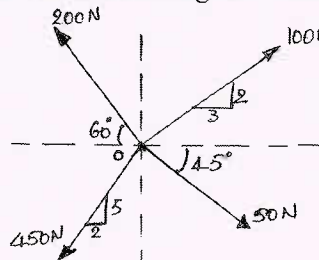


Fig.Q.3(b)

**OR**

- 4 a. Define:
  - i) Coefficient of friction
  - ii) Angle of friction
  - iii) Angle of repose
  - iv) Limiting friction. (08 Marks)

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

- b. A sphere of weight 100N rests against a vertical wall as shown in Fig.Q.4(b). If the sphere is 100mm radius and the rope RS is 400mm length, find the minimum horizontal force 'P' necessary to move the sphere free from the wall. (04 Marks)

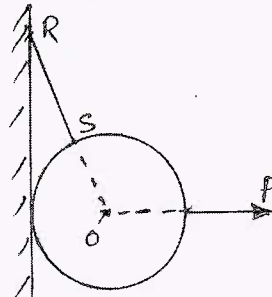


Fig.Q.4(b)

- c. Determine the value of  $W_1$  and  $W_2$  shown in Fig.Q.5(c) to keep BC horizontal. (04 Marks)

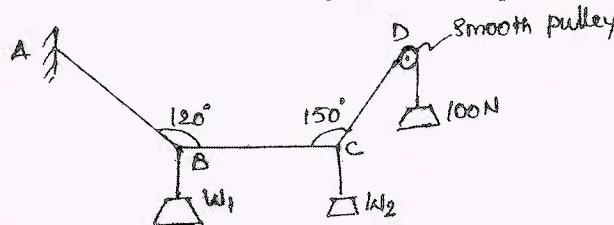


Fig.Q.5(c)

**Module-3**

- 5 a. State and prove Varignon's theorem. (08 Marks)  
 b. Determine the support reactions at A and B for the beam shown in Fig.Q.5(b) (08 Marks)

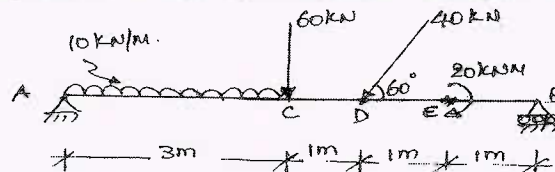


Fig.Q.5(b)

**OR**

- 6 a. Explain the different types of supports for beams. (08 Marks)  
 b. Find the resultant of the system of coplanar forces acting on a lamina as shown in Fig.Q.6(b). Each square has a side of 10mm. (08 Marks)

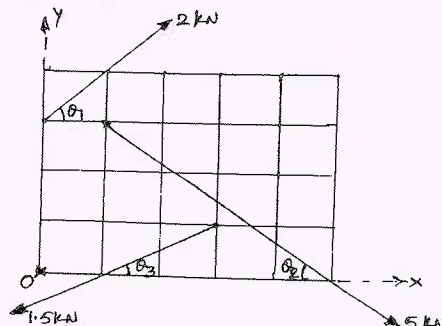


Fig.Q.6(b)

**Module-4**

- 7 a. State and prove parallel axis theorem. (08 Marks)  
 b. Locate the centroid for the shaded area shown in Fig.Q.7(b) with respect to 'O'. (08 Marks)

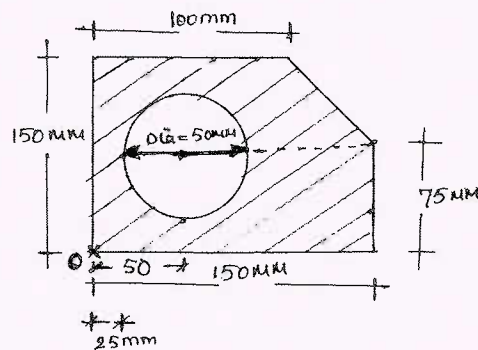


Fig.Q.7(b)

**OR**

- 8 a. Determine the moment of inertia of the shaded area shown in Fig.Q.8(a) about x x axis. (08 Marks)

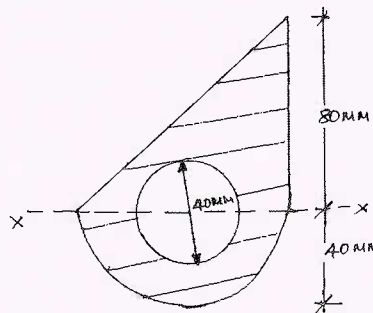


Fig.Q.8(a)

- b. Derive the expression of centroid of a semicircle by the method of integration. (08 Marks)

**Module-5**

- 9 a. Define: i) Displacement ii) Acceleration iii) Velocity iv) Speed. (08 Marks)  
 b. Burglars car starts with an acceleration of  $2\text{m/sec}^2$ . A police van came after 10 seconds and continued to chase the burglars car with uniform velocity of  $40\text{m/sec}$ . Find the time taken by the police van to overtake the burglars car. (08 Marks)

**OR**

- 10 a. A ball is dropped from the top of a tower  $30\text{m}$  high. At the same instant a second ball is thrown upward from the ground with an initial velocity of  $15\text{m/sec}$ . When and where do they pass? (08 Marks)  
 b. A pilot flying his bomber at a height of  $2000\text{m}$  with uniform horizontal velocity of  $600\text{ kmph}$  wants to strike a target. At what distance from the target he should release the bomb. (08 Marks)

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18ELE13/23

## First/Second Semester B.E. Degree Examination, June/July 2019 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. (08 Marks)
- b. Define form factor and peak factor. Obtain their values for a sinusoid voltage. (06 Marks)
- c. A circuit consists of two parallel resistors having resistances of  $20\Omega$  and  $30\Omega$  respectively connected in series with a  $15\Omega$  resistor. If current through  $15\Omega$  resistor is  $3A$ , find,
  - i) Current through the branches.
  - ii) Voltage across whole circuit
  - iii) Power consumed by  $20\Omega$  and  $15\Omega$  resistors. (06 Marks)

**OR**

- 2 a. Define average and rms value of a sinusoid. Also derive the respective expressions. (08 Marks)
- b. Find the potential difference between XY for the network shown below Fig.Q.2(b). (06 Marks)

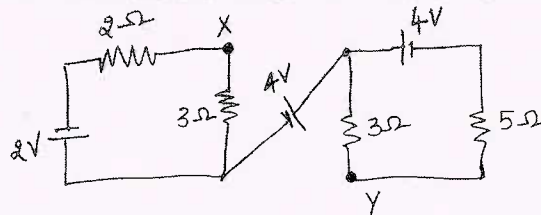


Fig. Q.2(b)

- c. State Ohm's Law. Mention its limitations. (06 Marks)

### Module-2

- 3 a. Obtain the behaviour of voltage, current and power in a pure inductor. Connected to single phase ac supply. (08 Marks)
- b. Show that,  $3\phi$  power can be measured using only two wattmeters for a balanced star connected load. (06 Marks)
- c. A  $3\phi$  load of 3 equal impedances are connected in delta across a balanced  $400V$ ,  $50Hz$ ,  $3\phi$  supply which takes a line current of  $10A$  at a power factor of  $0.7$  lagging. Calculate: i) Phase current ii) Total power in  $W$  iii) Power in  $VA$  iv) Power in  $VAR$ . (06 Marks)

**OR**

- 4 a. Obtain expressions for line and phase relationship of voltage, current and power in a  $3\phi$  star connected system. (08 Marks)
- b. An alternating voltage of  $(160 + j120)V$  is applied to a circuit and the current is given by  $(6 + j8)A$ . Find the values of circuit elements by assuming  $f = 50Hz$ . Calculate the power factor of the circuit and power consumed by the circuit. (06 Marks)
- c. A balanced  $3\phi$  star connected system draws power from  $440V$  supply. The two Wattmeters connected indicate  $W_1 = 5kW$  and  $W_2 = 1.2kW$ . Calculate power, power factor and current in the circuit. (06 Marks)

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

**Module-3**

- 5 a. Explain electrical shock, its causes and precautions to be taken to prevent them. (08 Marks)  
 b. Discuss about various types of losses in a transformer. (06 Marks)  
 c. A 250KVA; 11,000/415 Volts, 50Hz, 1 $\phi$  transformer has 80 turns on the secondary. Calculate:  
 i) Rated primary and secondary currents  
 ii) Number of primary turns  
 iii) Maximum value of flux in the core  
 iv) Voltage induced/turn on secondary. (06 Marks)

**OR**

- 6 a. A 500kVA, 1 $\phi$  transformer has an efficiency of 92% at full load, upf and at half the full load, 0.9pf. Determine its efficiency at 80% of the full load and 0.95pf. (08 Marks)  
 b. Discuss about necessity of earthing, with a neat diagram explain pipe earthing. (06 Marks)  
 c. Write short notes on: i) Fuse ii) MCB. (06 Marks)

**Module-4**

- 7 a. With a neat sketch, explain construction of a DC machine. (08 Marks)  
 b. A 4 pole, 230V, DC series, wave connected armature with 1254 conductors, with flux per pole of 22mWb, takes 50A for motoring. The armature and series field coil resistances are 0.3 $\Omega$  and 0.2 $\Omega$  respectively. Calculate the speed and torque developed in Watts. (06 Marks)  
 c. Brief on characteristics of a DC shunt motor with neat diagrams. (06 Marks)

**OR**

- 8 a. Define back emf and derive torque equations for a DC motor. (08 Marks)  
 b. A shunt generator has 4 poles, lap wound armature having 24 slots with 10 conductors/slot. If the flux/pole is 0.04Wb. and the speed is 1500rpm, calculate the emf generated in the armature. What would be the generated emf if the winding is wave connected? (06 Marks)  
 c. Give the classification of DC generators with their equivalent circuit diagrams. (06 Marks)

**Module-5**

- 9 a. Explain the principle of working of an induction motor. (08 Marks)  
 b. List the advantages of rotating field over rotating armature. (06 Marks)  
 c. A 3 $\phi$ , 6-pole, star connected alternator, revolves at 1000rpm. The stator has 90 slots and 8 conductors/slot. The flux per pole is 0.05 Wb. Calculate the voltage generated by the machine if winding factor is 0.96. (06 Marks)

**OR**

- 10 a. Explain the working principle of an alternator. Also derive its emf equation. (08 Marks)  
 b. Compare squirrel cage and slip ring types of rotors of an Induction motor. (06 Marks)  
 c. An 8 pole alternator runs at 750 rpm, supplies power to a 4 pole induction motor. The frequency of the rotor is 1.5Hz. What is the speed of the motor? (06 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2019

## 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
- State and explain Kirchhoff's laws with an example. (06 Marks)
  - A resistance  $R$  is connected in series with a parallel circuit comprising of  $20\Omega$  and  $48\Omega$ . The total power dissipated in the circuit is  $1000\text{w}$  and the applied voltage is  $250\text{V}$ . Calculate  $R$  and the current through  $R$ . (06 Marks)
  - State and explain Faraday's laws of electromagnetic induction. (08 Marks)

OR

- 2
- Obtain an expression for energy stored in an inductor. (06 Marks)
  - A coil consists of 1000 turns and a current of  $10\text{A}$  in the coil gives rise to a magnetic flux of  $2\text{mwb}$ . Calculate i) self inductance of the coil ii) the energy stored iii) the emf induced when the current is reversed in  $0.01\text{sec}$ . (07 Marks)
  - Define coefficient of coupling and derive its relationship with self inductances and the mutual inductance. (07 Marks)

### Module-2

- 3
- Derive the EMF equation of a DC generator. (06 Marks)
  - An 8 pole DC generator has 500 armature conductors and useful flux/pole of  $0.065\text{wb}$ . What will be the emf generated if it is lap connected and runs at  $1000\text{rpm}$ ? At what speed it must be driven to produce the same emf if it is wave connected? (06 Marks)
  - With a neat diagram, explain the construction and working of an induction type energy meter. (08 Marks)

OR

- 4
- Derive the expression for armature torque developed in a DC motor. (06 Marks)
  - A 4pole,  $220\text{V}$  lap connected DC shunt motor has 36 slots, each slot containing 16 conductors. It draws a current of  $40\text{A}$  from the supply. The field resistance and armature resistances are  $110\Omega$  and  $0.1\Omega$  respectively. The flux/pole is  $40\text{ mwb}$ . Calculate i) the speed ii) the torque developed by the armature iii) shaft torque if the output power is  $6\text{ KW}$ . (08 Marks)
  - With the help of a neat diagram, explain the construction and working principle of electro-dynamometer type wattmeter. (06 Marks)

### Module-3

- 5
- Derive an expression for the power consumed in a series R-L- ac circuit and draw voltage, current and power waveform. (06 Marks)
  - With a neat sketch, explain 2-way control of lamps. (06 Marks)
  - A series circuits of a resistance of  $10\Omega$ , an inductance of  $16\text{mH}$  and a capacitance of  $150\mu\text{F}$  connected in series. A supply of  $100\text{V}$  at  $50\text{Hz}$  is given to the circuit. Find the impedance, current p.f and power consumed in the circuit. (08 Marks)

1 of 2

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



OR

- 6 a. Prove that the power consumed in a pure capacitor is zero, when connected to an alternating voltage source. Draw the waveforms for voltage, current and power (06 Marks)
- b. What is earthing? Explain any one type of earthing with a neat diagram. (06 Marks)
- c. A parallel circuit has a resistor of  $20\Omega$  in series with an inductive reactance of  $15\Omega$  in one branch and a resistor of  $30\Omega$  in series with a capacitive reactance of  $20\Omega$  in the other branch. If the total current drawn by the parallel circuit is  $10\sqrt{30}$  Amps, determine the current and power dissipated in each branch. (08 Marks)

Module-4

- 7 a. Obtain the relationship between phase and line values of voltages and currents in a balanced star connected system. (06 Marks)
- b. With neat sketches, explain the construction of two types of alternators. (08 Marks)
- c. A 3-phase 50Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors/slot. The flux/pole is 24.8 mwb and the coils are full pitched. Find: i) the speed ii) the line emf. Assume the distribution factor  $k_d = 0.96$ . (06 Marks)

OR

- 8 a. Show that two wattmeters are sufficient to measure 3 phase power and power factor of the circuit in a 3 phase balanced circuit. (08 Marks)
- b. A balanced 3 phase star connected system draws power from 440V supply. The 2 wattmeters connected indicate  $W_1 = 5\text{Kw}$  and  $W_2 = 1.2\text{KW}$ . Calculate power, power factor and current in the circuit. (06 Marks)
- c. Derive the emf equation of an alternator with usual notations. (06 Marks)

Module-5

- 9 a. Explain the principle of working of a single phase transformer and derive the expression for K. (06 Marks)
- b. The primary winding of a 25KVA transformer has 200 turns and is connected to 230, 50Hz supply. The secondary turns are 50. Calculate : i) no load secondary emf ii) full load primary and secondary currents iii) the flux density in the core, if the cross section of the core  $60\text{cm}^2$ . (06 Marks)
- c. Explain the concept of rotating magnetic field in case of a 3phase induction motor. (08 Marks)

OR

- 10 a. Explain the losses occurring in a single phase transformer. (06 Marks)
- b. A transformer is rated at 100KVA. At full load its copper loss is 1200W and the iron loss is 960W. Calculate :  
 i) The efficiency of full load, u.p.f  
 ii) The efficiency of at half load, 0.8p.f  
 iii) The load KVA at which maximum efficiency occurs  
 iv) Maximum efficiency at 0.85 p.f. (08 Marks)
- c. A 4 pole, 3- $\phi$ , 50Hz induction motor runs at a speed of 1470rpm. Find the synchronous speed, the slip and frequency of the induced emf in the rotor under this condition. (06 Marks)

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15ELE15/25

## First/Second Semester B.E. Degree Examination, June/July 2019 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 Kirchhoff's laws. For the circuit shown in Fig.Q1(a) if  $V_a = 60V$ ,  $V_b = 20V$ ,  $R_a = 20\Omega$ ,  $R_b = 5\Omega$ . Find  $V_c$  the voltage across  $R_c$ . (07 Marks)

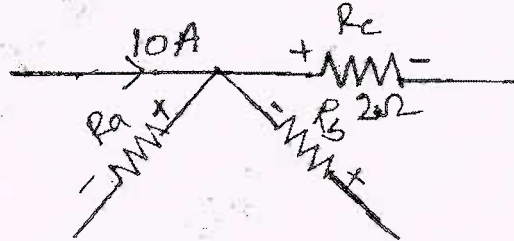


Fig.Q1(a)

- b. Explain statically and dynamically induced EMF's. (04 Marks)
- c. Two identical coils of 1200 turns each are placed side by side such that 60% of flux produced by coil links the other. A current of 10Amps in first coil sets up a flux of 0.12milli webers. If current in first coil changes from 10 Amps to -10 Amps in 20 milli seconds. Find :
- i) Self inductance of coils
  - ii) The E.M.F's induced in both the coils. (05 Marks)

**OR**

- 2 a. For the circuit shown in Fig. Q2(a). i) Find 'R' ii) current through  $20\Omega$  resistance iii) power supplied by source if power dissipated in  $40\Omega$  is 160 watts. (06 Marks)

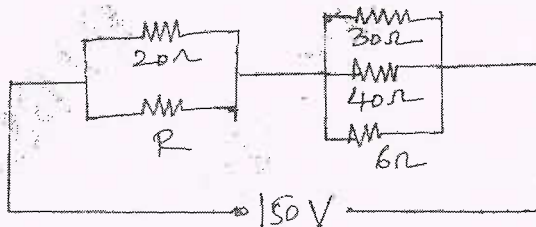


Fig.Q2(a)

- b. State Lenz's law and Flemings left hand rule. (04 Marks)
- c. For the circuit shown in Fig. Q2(c). Find voltage across AB i) with switch 'S' open ii) with switch 'S' closed. (06 Marks)

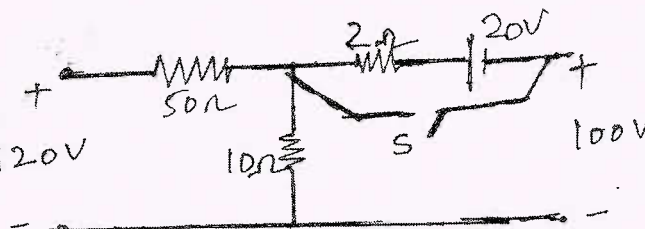


Fig.Q2(c)

1 of 3

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

Module-2

- 3 a. Derive Torque equation for a DC motor (04 Marks)  
 b. Explain with neat diagram the constructional features and operation of an induction type single phase energy meter. Show that revolution of disc is proportional to energy consumed. (06 Marks)  
 c. A 40 KW long shunt compound generator supplies full load current at a load voltage of 400V. The shunt and series field resistances are  $100\Omega$  and  $0.05\Omega$  respectively.  
 Find :  
 i) Load resistance ii) armature current iii) induced EMF. (06 Marks)

**OR**

- 4 a. A 4-pole DC shunt motor working on 250 volts takes a current of 2 amperes when running at 1000 RPM. What will be its back EMF, speed if motor takes 51A at certain load? Armature and shunt field resistances are  $0.2\Omega$  and  $250\Omega$  respectively. (06 Marks)  
 b. Derive EMF equation of a DC generator. (06 Marks)  
 c. Explain the significance of back EMF and necessity of a starter for a DC motor. (04 Marks)

Module-3

- 5 a. For circuit shown in Fig.Q5(a) find current in all branches. Draw vector diagram. (06 Marks)

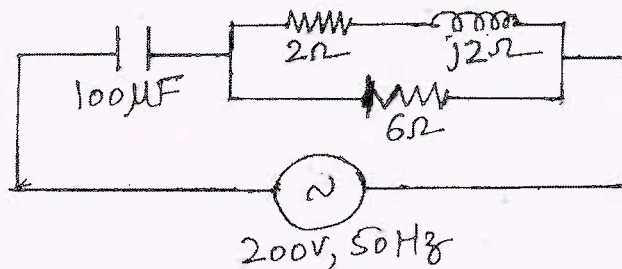


Fig.Q5(a)

- b. With neat diagram, explain plate Earthing. (05 Marks)  
 c. Derive the expression for average power consumed in an R-L series circuit. (05 Marks)

**OR**

- 6 a. Derive RMS value for sinusoidal voltage with definition. (05 Marks)  
 b. With suitable circuit diagrams table the operations of two way control of lamps. (05 Marks)  
 c. A certain takes a current of  $(-5 + j10)$  amperes when applied voltage is  $(50 + j200)$  volts. If the frequency of the supply is 50Hz, Find :  
 i) Circuit elements ii) apparent power iii) reactive power iv) power factor. (06 Marks)

Module-4

- 7 a. Show that with necessary circuit and vector diagram the two wattmeters used to measure power reads equal in a 3-phase balanced star connected purely resistive load. (06 Marks)  
 b. Derive the EMF equation of an 3 – phase synchronous generator. (04 Marks)  
 c. Three identical resistors are connected in star across 400V, 50Hz AC supply. The line current is 10Amps. Find power consumed when resistors are reconnected in delta with line current remaining the same. (06 Marks)

**OR**

- 8 a. A 3 – phase star connected alternator on open circuit is required to generate a line voltage of 3600V, 50Hz when driven at 500 RPM. The stator has 3 slots/pole/phase and 10 conductors/slot. Calculate useful flux/pole by assuming full pitched coils. (07 Marks)
- b. A certain 3–phase load takes 20KW at 25 KVA. Find the reading of two wattmeters to measure power. (04 Marks)
- c. With neat diagram, explain the construction and working of salient pole alternator.(05 Marks)

**Module-5**

- 9 a. Derive the EMF equation of a single-phase transformer. (04 Marks)
- b. Derive the condition for maximum efficiency and define voltage regulation for a single phase transformer. (06 Marks)
- c. The EMF in the stator of an 8-pole induction motor has a frequency of 50Hz and that of rotor is 1.5Hz. Find the speed of the rotor and slip. (06 Marks)

**OR**

- 10 a. With neat diagram, explain the star-delta starter for an 3-phase induction motor. (05 Marks)
- b. A transformer has a maximum efficiency of 98% at three–fourth load and unity power factor. The copper loss at this load is 314 watts. Compute the efficiency of transformer at 80% load with same power factor. (07 Marks)
- c. Explain the working of an squirrel cage induction motor with neat diagrams. (04 Marks)

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14ELE15/25

**First/Second Semester B.E. Degree Examination, June/July 2019**  
**Basic Electrical Engineering**

Time: 3 hrs.

Max. Marks: 100

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

Module – 1

- 1 a. For the figure Q1 (a), calculate the value of 'R' and applied voltage V. (08 Marks)

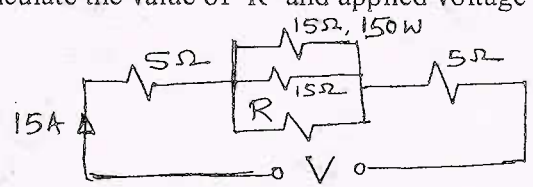


Fig. Q1 (a)

- b. With examples clearly differentiate between statically induced emf and dynamically induced emf. (06 Marks)
- c. Define coefficient of coupling and establish a relation between self inductance, mutual inductance with the coefficient of coupling. (06 Marks)
- 2 a. A battery of 40 V and internal resistance of 2 Ω is connected in parallel with a second battery of 44 V and internal resistance of 4 Ω. A load resistance of 6 Ω is connected across the ends of the parallel circuit. Calculate the current in each battery and in the load. (08 Marks)
- b. Compare electric circuit and magnetic circuit. (06 Marks)
- c. State Faraday's laws of electromagnetic induction and Lenz's laws. (06 Marks)

Module – 2

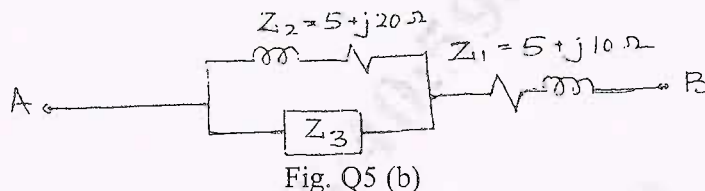
- 3 a. Derive an expression for Armature torque in DC motor. (06 Marks)
- b. An 8 pole dc generator has 500 conductors on its armature, and is designed to have 0.02 wb of magnetic flux per pole crossing the air gap with normal excitation (A) What voltage will be generated at a speed of 1800 rpm, if the armature is (i) wave wound (ii) lap wound? (B) If the allowable current is 5 A per path, what will be the power generated by the machine in each case? (08 Marks)
- c. Explain the construction and working of Dynamometer type wattmeter. Draw the circuit diagram. (06 Marks)
- 4 a. Derive the emf equation of DC Generator. (06 Marks)
- b. A 230 V DC shunt motor takes a no load current of 3A and runs at 1100 rpm. If the full load current is 41 A. Find the speed on full load. Assume armature resistance 0.25 Ω and shunt field resistance 230 Ω. (08 Marks)
- c. With a neat sketch, explain the working of single phase induction type energy meter. (06 Marks)

Module – 3

- 5 a. Show that, the power consumed in a pure inductance is zero and derive the expression for current, with voltage sinusoidally varying. (06 Marks)

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

- 5 b. When 220 V AC supply is applied across AB terminals for the circuit shown in Fig. Q5 (b), the power input is 3.25 kW and the current is 20 A. Find the current through  $Z_3$ . (08 Marks)



- c. With a neat sketch, explain the construction and working of residual current circuit Breaker. (06 Marks)
- 6 a. A resistance  $R$  in series with a capacitor  $C$  is connected to 50 Hz, 240 V supply. Find the value of  $C$  so that  $R$  absorbs 300 W at 100 V. Find also the maximum charge and maximum energy stored in  $C$ . (08 Marks)
- b. Derive expressions for calculating the impedance of a series RL circuit. Draw voltage triangle. Also draw the phasor diagram and explain. (06 Marks)
- c. What is the necessity of earthing? Explain with neat sketch the pipe earthing. (06 Marks)

#### Module – 4

- 7 a. What are the advantages of three phase voltage system over single phase voltage system? (04 Marks)
- b. Three,  $50 \Omega$  resistors are connected in star across 3-phase 400 V supply.  
 (i) Find phase current, line current and power taken from ac supply.  
 (ii) What would be the above values if the resistors were delta connected? (08 Marks)
- c. With neat diagrams, explain the constructional features of a 3-phase alternator. (08 Marks)
- 8 a. With the relevant vector diagram, show that only two wattmeters are sufficient to measure three phase power for balance lagging p.f. load. (08 Marks)
- b. List the advantages of having stationary armature and rotating field system in large size alternators. (06 Marks)
- c. A 3-phase, 16-pole star connected alternator has 144 slots on the armature periphery. Each slots consists of 10 conductors. It is driven at 375 rpm. The line value of emf available across the terminals is 2667 V. Find the frequency of the induced emf and flux per pole. Assume  $K_p = 1$  and  $K_d = 0.96$ . (06 Marks)

#### Module – 5

- 9 a. Explain various losses in transformers. How these losses can be minimized? (06 Marks)
- b. A 600 KVA transformer has an efficiency of 92% both at half load uPF and full load 0.9 p.f. Calculate its efficiency at 75% of full load and 0.8 p.f. (08 Marks)
- c. Explain the principle of operation of a 3-phase induction motor and give reason for why an induction motor cannot run at synchronous speed? (06 Marks)
- 10 a. Derive the emf equation of a transformer and explain types of transformers. (06 Marks)
- b. The rotor induced voltage of a three phase, 4-pole squirrel cage induction motor fed by a salient pole alternator is observed to make 1.5 alterations per second. The star connected alternator with 592, full pitched armature conductors in series per phase with  $K_d = 0.966$  develops a line voltage of 6600 V when the flux per pole is 60 mwb. Determine the speed of the induction motor. (08 Marks)
- c. Explain, why an induction motor draws high current during starting? (06 Marks)

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