USN ☐☐☐☐☐☐☐☐☐☐ **17PHY12/22**

First/Second Semester B.E. Degree Examination, June/July 2018
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 : C = 3 × 10⁸ m/s , h = 6.63× 10⁻³⁴ JS , K = 1.38 × 10⁻²³ J/K ,*
m = 9.11 × 10⁻³¹ kg , e = 1.6× 10⁻¹⁹ C , NA = 6.02 × 10²⁶ kmol.

Module-1

1 a. Define a black body. Deduce Wien's law and Rayleigh Jeans law from Planks law of Radiation. **(07 Marks)**
   b. Set – up One dimensional time independent Schrodinger wave equation. **(06 Marks)**
   c. Explain the energy distribution in the spectrum of Black body. **(03 Marks)**
   d. An electron is bound in one dimensional potential well of width 0.12nm. Find the energy values in the ground state and also in first two excited states. **(04 Marks)**

OR

2 a. State Heisenberg's Uncertainty Principle. Show that free electrons cannot exist inside the nucleus. **(07 Marks)**
   b. Define Phase Velocity and Group Velocity. Derive the relation between them. **(06 Marks)**
   c. Write a note on Compton effect. **(03 Marks)**
   d. A particle of mass 0.65MeV/C² has free energy 120MeV. Find its deBroglie wavelength. [Where 'C' is speed of light]. **(04 Marks)**

Module-2

3 a. What is Fermi Factor? Discuss the variation of Fermi factor with temperature. **(07 Marks)**
   b. What is Superconductivity? Explain Type – I and Type – II superconductors. **(06 Marks)**
   c. Define : i) Mean collision time   ii) Relaxation time   iii) Drift velocity. **(03 Marks)**
   d. Find the probability that an energy level at 0.2eV below fermi level being occupied at temperatures 300K and 1000K. **(04 Marks)**

OR

4 a. Derive the expression for electrical conductivity by using Quantum free electron theory in case of metals. **(07 Marks)**
   b. Explain the failures of CFET. (Classical Free Electron Theory). **(06 Marks)**
   c. Write a note on High temperature superconductors. **(03 Marks)**
   d. The electron and hole mobilities of silicon are 0.14 m²V⁻¹S⁻¹ and 0.05 m²V⁻¹S⁻¹ respectively at a certain temperature. If the electron density is 1.5 × 10¹⁶ electrons/m³ then calculate the resistivity of silicon. **(04 Marks)**

Module-3

5 a. Obtain an expression for energy density of radiation in terms of Einsteins co-efficient. **(07 Marks)**
   b. Write a note on different types of optical fibers. **(06 Marks)**
   c. Mention any three applications of LASERS. **(03 Marks)**
   d. Calculate the Numerical aperture, V – number and and number of modes in an optical fibre of core diameter 50μm. Refractive indices are 1.41 and 1.40 respectively at wavelength of 820nm. **(04 Marks)**

OR

6 a. Explain the construction and working of CO_2 Laser with the help of energy level diagram.
(07 Marks)

b. What is Holography? With a neat diagram, explain the recording and reconstruction process of a Hologram. (06 Marks)

c. Define : i) Numerical Aperture   ii) Angle of Acceptance   iii) Attenuation. (03 Marks)

d. Find the ratio of the populations of the two states in a material that produces light of wavelength 6328 $\overset{0}{A}$ at 27^0C. (04 Marks)

Module-4

7 a. What are Miller Indices? Derive an expression for Interplanar distances in terms of Miller Indices. (07 Marks)

b. Explain Bragg's X – ray Spectrometer. (06 Marks)

c. Define : i) Unit cell   ii) Bravaice Lattice   iii) Primitive cell. (03 Marks)

d. Draw the following planes in a cubic unit cell :
i) (1 1 1)   ii) (0 2 0)   iii) (1 $\bar{1}$ 2)   iv) (3 0 1). (04 Marks)

OR

8 a. Explain in brief the Seven Crystal systems, with neat diagrams. (07 Marks)

b. Explain the crystal structure of diamond. (05 Marks)

c. Calculate APF for BCC and FCC structures. (04 Marks)

d. X – rays are diffracted in the first order from (110) plane of cubic crystal with lattice constant 3.036 $\overset{0}{A}$ at a glancing angle 9.6^0. Calculate the wavelength of X – rays. (04 Marks)

Module-5

9 a. What are Shock waves? Explain the construction and working of Reddy Shock tube.
(07 Marks)

b. What are Nano materials? Explain the Sol – gel method of synthesis of nano materials.
(06 Marks)

c. Mention four applications of shock waves. (04 Marks)

d. Calculate the wavelength of an electron accelerated under a potential difference of 100V in SEM. (03 Marks)

OR

10 a. Explain the principle, construction and working of Scanning Electron Microscope.
(07 Marks)

b. Define Carbon Nanotubes (CNTs). Discuss pyrolysis method of obtaining CNTs.
(06 Marks)

c. Mention three applications of CNTs. (03 Marks)

d. Distinguish between Acoustic, Ultrasonic , Subsonic and Supersonic waves. (04 Marks)

* * * * *

USN | | | | | | | | | | **15PHY12/22**

First/Second Semester B.E. Degree Examination, June/July 2018
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: Plank's constant h = 6.63 × 10⁻³⁴ JS, Mass of electron M_e = 9.11×10⁻³¹kg*
Boltzmann constant K = 1.38 × 10⁻²³ J/K, Avogadro's number N_A = 6.025×10⁺²⁶/Kmole,
Velocity of light C = 3 ×10⁸ m/s. mass of neutron m_n = 1.678 × 10⁻²⁷ kg.

Module-1

1 a. Define Group velocity and phase velocity show that group velocity is less than phase velocity. **(06 Marks)**
   b. Using Schrodinger's time independent wave equations arrive at the expression for eigen values. **(06 Marks)**
   c. A particle of mass $\dfrac{0.65\text{MeV}}{C^2}$ has Kinetic energy 80eV. Find the de-Broglie wavelength, group velocity and phase velocity of de-Broglie (where C is velocity of light). **(04 Marks)**

OR

2 a. Set up dimensional time independent Schrödinger wave equation. **(06 Marks)**
   b. What is a black body? Discuss why the Blackbody radiation spectrum could not be explained by the Wien's and Rayleigh Jean's theories. **(05 Marks)**
   c. Compare the energy of a photon with that of a neutron when both are associated with wavelength of 1°A. **(05 Marks)**

Module-2

3 a. What are the assumptions of classical free electron theory? Define i) Mean free path ii) Drift velocity. **(06 Marks)**
   b. What is Fermi factor? Discuss the dependence of Fermi factor on temperature and effect on occupancy of energy levels. **(06 Marks)**
   c. Calculate the Fermi temperature (T_F) and Fermi Velocity (V_F) in case of copper metal with Fermi energy 6.8eV. **(04 Marks)**

OR

4 a. Explain the merits of Quantum free electron theory. **(06 Marks)**
   b. Describe the types of superconductors. **(05 Marks)**
   c. What is superconductivity? Explain the working of Maglev vehicles. **(05 Marks)**

Module-3

5 a. With suitable diagrams, explain the types of optical fibers. **(06 Marks)**
   b. Describe construction and working of semiconductor laser with energy band diagram. **(06 Marks)**
   c. A laser pulse with power per pulse of 1mW lasts 10ns. If the number of photons emitted per pulse is 3.491 × 10⁷. Calculate wavelength of laser. **(04 Marks)**

OR

6 a. Explain the terms population inversion and metastable state. Discuss the requisites of a typical laser. **(06 Marks)**

b. What is attenuation? Discuss various factors that contribute to loss of signal strength during propagation of light through optical fiber. **(06 Marks)**

c. Numerical aperture of an optical fiber is 0.3 when surrounded by air. Determine the refractive index of its core given the refractive index of cladding is 1.59. Also find the acceptance angle when it is in a medium of refractive index 1.33. **(04 Marks)**

Module-4

7 a. Define Miller Indices and obtain expression for inter-planar spacing in terms of Miller Indices in cubic structure. **(06 Marks)**

b. What is polymorphism and Allotropy? Show that Atomic packing factor in SCC is 0.52 and in fcc is 0.74. **(06 Marks)**

c. Draw the following crystal planes (132), (001), (101) and (OTO). **(04 Marks)**

OR

8 a. Define atomic packing factor and co-ordination number Determine the co-ordination number in BCC structure. **(04Marks)**

b. Discuss briefly the seven crystal systems. Draw crystal structures for cubic system. **(08 Marks)**

c. A monochromatic beam of electrons with Kinetic energy 235.2eV undergoes first order Bragg reflection in a crystal at a glancing angle of $9°12'35''$. Calculate the interplanar spacing. **(04Marks)**

Module-5

9 a. What are nano-materials? Explain the Arc discharge method of manufacturing Carbon nanotubes. **(06 Marks)**

b. Explain the principle construction working of scanning Electron microscope with neat sketch. **(06 Marks)**

c. Define terms : i) Shock wave   ii) Mach number   iii) Subsonic   iv) Supersonic waves. **(04 Marks)**

OR

10 a. Describe the hand operated Reddy shock tube with a neat diagram. **(06 Marks)**

b. Explain the Sol-Gel method of manufacturing nanomaterials. **(05 Marks)**

c. Discuss five important applications of shock waves. **(05 Marks)**

* * * * *

First/Second Semester B.E. Degree Examination, June/July 2018
Engineering Physics

Time: 3 hrs.   Max. Marks:100

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

Module – 1

1 a. What is Planck's Radiation Law? Explain how it overcomes the drawbacks of Wien's law and Rayleigh Jeans law. **(07 Marks)**
   b. Show that the group velocity is same as particle velocity. **(04 Marks)**
   c. What is a wave function? Give its physical significance. **(05 Marks)**
   d. Calculate the value of difference in the energy of an electron in eV, bouncing back and forth between the second and third excited states of a path of 1 cm (Assume $h = 6.626 \times 10^{-34}$ J-S and mass of the electron = 9.1×10^{-31} kg) . **(04 Marks)**

2 a. Explain the duality of matter waves. **(03 Marks)**
   b. Explain Heisenberg's uncertainity principle. Based on this show that electrons donot present inside the nucleus. **(07 Marks)**
   c. Apply time independent Schrodinger's wave equation to a particle in a potential well of infinite height and discuss the solutions. **(10 Marks)**

Module – 2

3 a. Briefly describe the Relaxation time and drift velocity. **(04 Marks)**
   b. Show that the fermilevel in an intrinsic semiconductor has exactly halfway between conduction band and valence band. **(06 Marks)**
   c. Discuss the different types of superconductors. **(06 Marks)**
   d. Calculate the probability of finding the electron occupying an energy level 0.02 eV above fermilevel at 300 K in a material (Assume $K = 1.38 \times 10^{-23}$ J/K). **(04 Marks)**

4 a. What are the assumptions and success of quantum free electron theory? Explain one of them. **(06 Marks)**
   b. What is Hall effect? Obtain the expression for Hall coefficient in terms of Hall voltage. **(07 Marks)**
   c. Write a short note on Maglev vehicles. **(04 Marks)**
   d. Calculate the conductivity of an intrinsic Ge Semiconductor having carrier concentration of $2.4 \times 10^{19} / m^3$, given the mobility of the electron as 0.39 m^2/v/s and the hole mobility as 0.19 m^2/v/s. Assume the charge of electron as 1.6×10^{-19} C . **(03 Marks)**

Module – 3

5 a. What are Einstein's coefficients? Obtain the expression for energy density of radiation under equilibrium conditions in terms of Einstein's coefficient. **(07 Marks)**
   b. Describe briefly Laser welding and drilling processes. **(04 Marks)**
   c. Calculate the refractive index of the core of an optical fiber having the cladding index 1.59 and numerical aperture of 0.2, when surrounded by a medium of refractive index 1.33. **(04 Marks)**
   d. Describe the recording and reconstruction process of Holography. **(05 Marks)**

6 a. Describe the construction and working of CO_2 laser. (08 Marks)
   b. Obtain the expression of Numerical Aperture interms of refractive indices. (06 Marks)
   c. Discuss the different types of optical fibers. (06 Marks)

Module – 4

7 a. Obtain the expression for interplanar spacing interms of Miller indices for a cubic crystal. (06 Marks)
   b. Define Atomic packing factor. Calculate the atomic packing factor for BCC. (04 Marks)
   c. Define Allotrophy and polymorphism with an example. (04 Marks)
   d. Discuss qualitatively the structure of Pervoskite. (06 Marks)

8 a. Describe how Bragg's X-ray spectrometer is used for the determination of crystal structure. (10 Marks)
   b. Explain the working of Liquid Crystal Display. (06 Marks)
   c. Find the Miller indices of a set of parallel planes which make intercepts on X and Y axes as $\frac{a}{3}$ and $\frac{b}{4}$ respectively and parallel to z-axes, where a, b and c are being the primitive vectors of the lattice. (04 Marks)

Module – 5

9 a. Explain the construction and working of Reddy shock Tube. (08 Marks)
   b. Discuss the Ball-Milling and Sol-Gel method of synthesis of nano-materials and mention its advantages. (08 Marks)
   c. Write a short note on Carbon Nanotubes. (04 Marks)

10 a. What is Mach Number? Distinguish between acoustic, ultrasonic, subsonic and supersonic waves. (08 Marks)
   b. What are shock waves? List out few applications. (04 Marks)
   c. Describe the principle, construction and working of scanning electron microscope. (08 Marks)

* * * * *

CBCS SCHEME

USN **2 4 0 1 7 M G 0 0 3**

17ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2018
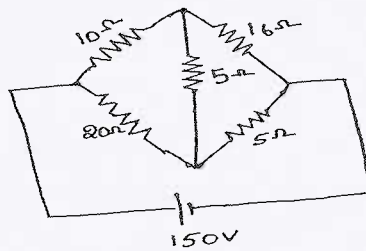## Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 100

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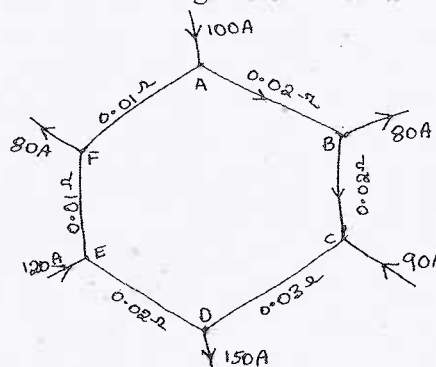
Module-1

1 a. State and explain Kirchoff's laws with an example. **(07 Marks)**

  b. For the bridge circuit shown in Fig.Q1(b), calculate current in all the branches and power supplied by the source. **(08 Marks)**

Fig.Q1(b)

  c. The winding of an electromagnet is wound with 96 turns and has resistance of 56 Ω. The exciting voltage is 250 volts, and the flux linking coil is 5 mWb. Find the energy stored in magnetic field. If the current is reversed in 0.1 sec, what emf is induced in the coil? **(05 Marks)**

OR

2 a. State and explain Ohm's law and also list out its limitations. **(06 Marks)**

  b. Define co-efficient of coupling and its relation with L_1, L_2 and M. **(06 Marks)**

  c. Find the currents in various branches of the given network shown in the Fig.Q2(c).

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

Module-2

3 a. Derive emf equation of D.C. generator. **(07 Marks)**

  b. With the neat diagram explain the construction and working of dynamometer type wattmeter. **(07 Marks)**

  c. A 4 pole lap connected DC generator has 600 armature conductors and runs at 1200 rpm. The generator has flux per pole is 0.06 Wb. Calculate emf induced. Find the speed at which it should be driven to produce the same emf when wave connected. **(06 Marks)**

OR

4 a. Derive the expression for armature torque. (08 Marks)
   b. With the neat diagram explain the construction and working of induction type energy meter. (08 Marks)
   c. List the applications of shunt and series motor. (04 Marks)

Module-3

5 a. Derive average value of sinusoidal voltage in terms of its maximum value. (06 Marks)
   b. With the sketch explain the working of three way control of lamp. (06 Marks)
   c. A voltage e = 100 sin 314t is applied to circuit consisting of 80 μF capacitor in series with 25 Ω resistor. Determine current and power factor in the circuit and also find voltage across the capacitor when current is half of its maximum value. (08 Marks)

OR

6 a. Show that power consumed by the pure capacitor is zero. Draw the voltage, current and power wave form. (06 Marks)
   b. Write a short note on :
      (i) Necessity of earthing (ii) Precaution to be taken to prevent electric shock. (07 Marks)
   c. A circuit consists of a resistance 10 Ω an inductance of 16 mH and a capacitance of 150 μF connected in series. A supply of 100 V, 50 Hz is applied to the circuit. Find the current, power factor and power consumed by the circuit. Draw the phasor diagram. (07 Marks)

Module-4

7 a. In 3ϕ star connection find the relation between line and phase values of current and voltage and also derive equation for 3ϕ power. (08 Marks)
   b. Write the differences between salient pole type and non salient pole type rotor of a synchronous generator. (06 Marks)
   c. Two wattmeters are connected to measure the input to a 3ϕ, 20 HP, 50 Hz induction motor that works at full load efficiency of 90% and the power factor of 0.85 lagging. Find the readings of two wattmeter. (06 Marks)

OR

8 a. Show that the 2 wattmeter are sufficient to measure 3ϕ power. (08 Marks)
   b. A 3ϕ 6 pole star connected alternator has an armature with 90 slots and 12 conductors per slot. It revolves at 1000 rpm, the flux per pole being 0.05 Wb, calculate the line value of the emf generated. If distribution factor 0.96 and pitch factor is 0.97. (06 Marks)
   c. A balanced star connected load of (8 + j6) per phase is connected to a 3ϕ, 230 V supply. Find the line current, power factor, reactive power and total volt amperes. (06 Marks)

Module-5

9 a. Derive emf equation of a transformer. (06 Marks)
   b. A 3ϕ induction motor with 4 poles is supplied from the alternator having 6 poles running at 1000 rpm. Calculate synchronous speed of the induction motor, its speed when slip is 0.04 and frequency of the rotor emf when the speed is 600 rpm. (08 Marks)
   c. Derive the condition for which the efficiency of a transformer is maximum. (06 Marks)

OR

10 a. Explain with diagrams the concept of rotating magnetic field in three phase induction motor. (08 Marks)
   b. A 500 kVA transformer has an efficiency of 92% at full load upf and at half full load 0.9 P.f. Determine its efficiency at 80% of full load and 0.95 P.f. (06 Marks)
   c. A 3ϕ, 50Hz, 6 pole induction motor has a full load percentage slip of 3% find synchronous speed and actual speed. (06 Marks)

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐ 15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2018
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 and explain ohm's law, mention its limitations. (05 Marks)
   b. Define the coefficient of coupling and find its relation with L_1, L_2 and M. (05 Marks)
   c. A current of 30A flows through two ammeters A_1 and A_2 connected in series. The potential differences across the two ammeters are 0.3V and 0.6V respectively. Find how the same current will divide when they are connected in parallel. (06 Marks)

OR

2 a. Derive an expression for energy stored in the magnetic field. (05 Marks)
   b. State and explain Kirchhoff's Laws. (05 Marks)
   c. A coil of 1000 turns is wound on a silicon steel ring having μ_r of 1200. The ring has a mean diameter of 10cm and cross sectional area of 12 Sq.cm. when a current of 4A flows through the coil find :
      i) Flux is the core
      ii) Inductance of the coil
      iii) The e.m.f induced in the coil. If the flux falls to zero in 15ms and
      iv) Now, if another similar coil is placed such that 70% magnetic coupling exists between the coils, find the mutual inductance. (06 Marks)

Module-2

3 a. Explain with neat sketch the constructional features of a D.C. Generator and mention the function of each part. (05 Marks)
   b. With the help of neat diagram, explain the construction and working principles of dynamometer type wattmeter. (05 Marks)
   c. A 4 pole shunt motor takes 22.5 amperes from a 250V supply. R_a = 0.5Ω and R_{sh} = 125Ω. The armature is wave wound with 300 conductors if the flux per pole is 0.02 wb, calculate :
      i) Speed
      ii) Torque developed
      iii) Power developed. (06 Marks)

OR

4 a. Derive an expression for the armature torque developed in a d.c motor. (05 Marks)
   b. Sketch and explain :
      i) Torque – armature current characteristics
      ii) Speed – armature current characteristic for a d.c shunt motor. (05 Marks)
   c. With a neat diagram, explain the working of an induction type of energy meter. (06 Marks)

Module-3

5 a. With the help of circuit diagram and phasor diagram, find the phase angle, impedance and power in case of R-L series circuit. (05 Marks)

b. With a neat diagram, explain the pipe earthing. **(05 Marks)**

c. A circuit consists of a resistance of 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, p.f and power consumed by the circuit. Draw the vector diagram. **(06 Marks)**

OR

6 a. Prove that the current in a purely inductive circuit lags behind the applied voltage by 90°. **(05 Marks)**

b. With relevant circuit diagrams and switching table, explain three way controls of Lamps. **(05 Marks)**

c. Two circuits A and B are connected in parallel across 200V, 50Hz supply circuit A consists of 10Ω resistance and 0.12H inductance in series while circuit B consists of 20Ω resistance in series with 40μF capacitor. Calculate :
   i) Current in each branch
   ii) Supply current
   iii) Total power factor. **(06 Marks)**

Module-4

7 a. For a three phase star connection, find the relation between line and phase values of current and voltages. Also derive the equation for the three phase power. **(05 Marks)**

b. Obtain the expression for emf of an alternator and give the significance of the winding factor. **(05 Marks)**

c. Two wattmeter's connected to measure the power in a 3 phase circuit read 5kW and 1kW. The latter being read after reversing the current coil. Calculate the power, power factor, total volt-amperes and reactive volt amperes. **(06 Marks)**

OR

8 a. With necessary sketches distinguish between salient pole and cylindrical pole type synchronous generator. **(05 Marks)**

b. Show that two wattmeter's are sufficient to measure power in 3-phase balanced star connected circuit with neat circuit and phasor diagram. **(05 Marks)**

c. A 6 pole 3 phase, 50Hz alternator 12 slot per pole and 4 conductor per slot. The winding is $\frac{5}{6}$ full pitched. A flux of 25 mwb per pole is sinusoidally distributed along the air gap. Determine the line e.m.f if the alternator is star connected. **(06 Marks)**

Module-5

9 a. Explain the various losses that occur in a transformer. **(05 Marks)**

b. Define slip. Derive an expression for frequency of rotor current. **(05 Marks)**

c. A 10KVA, 400/200V, 50Hz single phase transformer has a full load copper loss of 200W and has a full load efficiency of 96% at 0.8pf lagging. Determine the iron loss. What would be the efficiency at half of the full load and unity p.f? **(06 Marks)**

OR

10 a. Explain the principle of operation of a 3 phase Induction motor and give reason for an induction motor cannot run at synchronous speed. **(05 Marks)**

b. Derive the EMF equation of a transformer. **(05 Marks)**

c. A 4 pole 3 φ 50Hz induction motor runs at a speed of 1470 rpm. Find the synchronous speed, the slip and frequency of the induced emf in the rotor under this condition. **(06 Marks)**

* * * * *

2 of 2

14ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2018
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.   (06 Marks)
    b.   A resistor of 2.6 Ω is connected in series with a parallel combination of 4Ω and 6Ω resistors. If the power consumed in 4Ω resistor is 36 watts, find :
         (i)   Voltage across different resistors.
         (ii)   Source voltage.
         (iii)   Source current.   (08 Marks)
    c.   Compare and contrast electric and magnetic circuits.   (06 Marks)

2   a.   For the circuit shown in Fig. Q2 (a), find
         (i)   Current supplied by each battery.
         (ii)   Total current supplied to 10Ω resistor.
         (iii)   Total energy delivered to 10 Ω resistor, when the circuit is in ON condition for 4 hours.   (07 Marks)
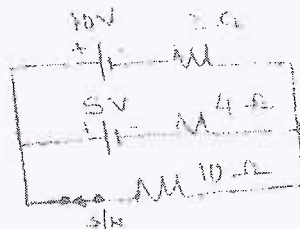

Fig. Q2 (a)

    b.   Obtain an expression for energy stored in an inductor.   (05 Marks)
    c.   Two coils X of 12,000 turns and Y of 15,000 turns, lie in parallel planes such that 45% of the flux produced by coil X links coil Y. A current of 5 A in X produces 0.05 wb while the same current in Y produces 0.075 wb. Calculate
         (i)   The mutual inductance   (ii)   The coupling coefficient
         (iii)   The percentage of flux produced by coil Y linking coil X.   (08 Marks)

Module – 2

3   a.   Give a brief classification of dc generators with equivalent circuits.   (06 Marks)
    b.   A 200 V, 4 pole, lap wound dc shunt motor has 800 armature conductors. The resistances of the armature and shunt field windings are 0.5 Ω and 200 Ω respectively. The motor takes a current of 21A and the flux produced per pole is 30 MWb. Find the speed and gross torque. There is brush contact drop of 1 volt across each brush.   (08 Marks)
    c.   Explain with a neat diagram, the construction and working principle of dynamometer type wattmeter.   (06 Marks)

4   a.   With usual notations, deduce an expression for emf induced in a dc generator.   (06 Marks)
    b.   What is back emf in a dc motor? What is its significance?   (04 Marks)
    c.   Explain, why a series motor should not be started without load over it?   (04 Marks)
    d.   With a neat diagram, explain the construction and working of induction type energy meter.   (06 Marks)

1 of 2

Module – 3

5 a. Explain the following terms:
   (i)   Peak value   (ii) Frequency
   (iii) RMS value with respect to an alternating quantity.   (06 Marks)

   b. Draw the vector diagram of RLC series circuit when:
   (i)   Inductive reactance exceeds capacitive reactance.
   (ii)   Capacitive reactance exceeds inductive reactance.
   (iii) Both inductive and capacitive reactances are equal.   (06 Marks)

   c. With neat diagram, explain control of a lamp from three different locations.   (05 Marks)

   d. What precautions should be taken against electric shock?   (03 Marks)

6 a. Prove that current in a pure inductive circuit lags behind the applied voltage by 90°. Also draw the power curves.   (07 Marks)

   b. A circuit drives a current of $(4+j3)A$ from a $(180+j160)$ volt source. Find the circuit elements, if the supply frequency is 50 Hz.   (07 Marks)

   c. Write notes on: (i)   Minitature Circuit Breaker (MCB)
                      (ii) Earth Leakage Circuit Breaker (ELCB).   (06 Marks)

Module – 4

7 a. What are the advantages of three phase over single phase system?   (05 Marks)

   b. Obtain relation between line and phase values of currents in three phase delta system.   (07 Marks)

   c. A 12 pole, 500 rpm star connected alternator has 60 slots with 20 conductors/slot. The flux /pole is 0.02 wb which is sinusoidally distributed. The winding factor is 0.97. Calculate frequency and magnitude of line and phase emfs.   (08 Marks)

8 a. Obtain an expression for power factor angle, when power is measured using two wattmeters.   (07 Marks)

   b. Three similar coils each having resistance of 10 Ω and inductive reactance of 8 Ω are connected in STAR across 400 V, 3 phase supply. Determine (i) Line current   (ii) Phase current   (iii) Total power and readings of each wattmeter connected to measure power.   (07 Marks)

   c. Explain different types of rotors in synchronous generators.   (06 Marks)

Module – 5

9 a. Show that iron losses and copper losses are equal for maximum efficiency in a transformer.   (06 Marks)

   b. A 250 KVA, 1 phase transformer has an efficiency of 98.135% at full load 0.8 lagging power factor. The efficiency was found to be 97.751% at half-full load 0.9 pf. Calculate iron and copper losses.   (08 Marks)

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

10 a. Obtain emf equation of transformer.   (06 Marks)

   b. Write about various losses that occur in a transformer.   (06 Marks)

   c. A four pole, 3 phase induction motor is supplied by 50 Hz AC supply. Find (i) Synchronous speed   (ii) Motor speed and   (iii) Frequency of rotor induced currents if the slip is 4%.   (08 Marks)

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐   **17EME14/24**

First/Second Semester B.E. Degree Examination, June/July 2018
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.   Differentiate between Renewable and Non-Renewable energy resources.   (04 Marks)
    b.   With a neat sketch explain the principle of operation of a typical wind mill.   (08 Marks)
    c.   Showing all the components explain the principle of electric power generation from Hydro power plants.   (08 Marks)

OR

2   a.   Explain the following terms with T-H diagram:
       (i) Wet steam   (i) Dry saturated steam   (iii) Super heated steam   (iv) Degree of superheat.   (08 Marks)
    b.   Name Boiler mountings and accessories. Explain its importance.   (04 Marks)
    c.   Explain with a neat sketch working principle of Babcock and Wilcox boiler.   (08 Marks)

Module-2

3   a.   With sketch explain working principle of De laval's Turbine.   (06 Marks)
    b.   Explain the working of closed cycle gas turbine.   (06 Marks)
    c.   Explain the working principle of Francis and Kaplan turbine.   (08 Marks)

OR

4   a.   How are IC engines classified? With a sketch explain the working principle of 4 stroke CI engine indicating PV-diagram.   (12 Marks)
    b.   A 4-stroke diesel engine has a piston diameter of 300 mm and stroke of 450 mm. Mean effective pressure is 4 bar, speed is 450 rpm. Diameter of the brake drum is 1 m and effective brake load is 450 N. Determine Indicated power, Brake power and Frictional power.   (08 Marks)

Module-3

5   a.   Explain with sketch following operations on Lathe:
       (i) Plane Turning   (ii) Knurling   (iii) Thread cutting   (06 Marks)
    b.   Explain with sketch the taper turning by swivelling compound tool rest.   (06 Marks)
    c.   With sketch explain the following operations :
       (i) Counter sinking   (ii) Counter boring   (iii) End milling   (iv) Slot milling   (08 Marks)

OR

6   a.   With a block diagram, explain the basic elements of NC automation system.   (06 Marks)
    b.   Classify the robot based on physical configuration. Explain the Cartesian coordinate robot with neat sketch.   (08 Marks)
    c.   Differentiate drilling and milling operation.   (06 Marks)

Module-4

7 a. How are composite classified? What are the applications of composites in automobile and aerospace industry? (06 Marks)
   b. Write a note on application of ferrous and non-ferrous alloys. (06 Marks)
   c. Explain with a sketch working of electric arc welding process. (08 Marks)

OR

8 a. Explain with a sketch working of oxy-acetylene welding process. (08 Marks)
   b. Differentiate between Welding, Brazing and Soldering. (06 Marks)
   c. Explain clearly the different types of oxy-acetylene flames generated. (06 Marks)

Module-5

9 a. Define Refrigeration and Air conditioning. (04 Marks)
   b. Name commonly used refrigerants. Explain any six goal properties of refrigerants. (08 Marks)
   c. Explain with a sketch working of vapour absorption refrigeration system. (08 Marks)

OR

10 a. Define :
   (i) Refrigeration effect   (ii) Ton of refrigeration   (iii) COP
   (iv) Ice making capacity   (v) Relative cop   (vi) Unit of refrigeration. (06 Marks)
   b. Differentiate between vapour compression and vapour absorption refrigerating system. (06 Marks)
   c. With sketch explain the working of Air conditioner. (08 Marks)

* * * * *

CBCS Scheme

First/Second Semester B.E. Degree Examination, June/July 2018
Elements of Mechanical Engineering

Time: 3 hrs.   Max. Marks: 80

Note: *1.* Answer any FIVE full questions, choosing
ONE full question from each module.
2. Draw neat sketch wherever required.

Module-1

1   a. Differentiate between conventional and non conventional energy sources (any five).
                                                                                (05 Marks)
    b. With a schematic layout, explain the nuclear power plant.   (05 Marks)
    c. Explain the three processes of utilization of solar energy.   (06 Marks)

OR

2   a. With a neat sketch, explain the BabCock and WilCock boiler.   (10 Marks)
    b. Explain the following :
        i) Dryness fraction
        ii) Latent heat of vaporisation
        iii) Enthalpy
        iv) Location and function of an economizer.   (06 Marks)

Module-2

3   a. Explain the working of a Delaval turbine with neat sketch.   (06 Marks)
    b. Differentiate between open and closed cycle gas turbine (any four).   (04 Marks)
    c. With a neat sketch. Explain the Pelton wheel.   (06 Marks)

OR

4   a. Explain the four stroke petrol engine with neat sketch and PV diagram. (08 Marks)
    b. A single cylinder 4-stroke IC engine has a bore of 180mm, stroke of 200mm and a rated speed of 300 rpm. The mean effective pressure is 6 bar. At full load, the torsion on the brake drum was 200N-m and 4kg of fuel was consumed in one hour. If the calorific value of the fuel is 42,000 kJ/kg, calculate the BP, IP, mechanical efficiency, indicated thermal efficiency and brake thermal efficiency.   (08 Marks)

Module-3

5   a. With a neat sketch, explain the taper turning by swiveling of compound rest. (06 Marks)
    b. Explain the following with neat sketches i) counter boring ii) reaming. (04 Marks)
    c. With neat sketches, explain slot and face milling.   (06 Marks)

OR

6 a. Define robot. Explain the classification of robots with neat sketches.   (10 Marks)
   b. Enumerate applications, advantages and disadvantages. (2 each).   (06 Marks)

Module-4

7 a. Explain the applications of ferrous and non ferrous metals (three each).   (06 Marks)
   b. Define composites. Enumerate the classification of composites.   (06 Marks)
   c. Enumerate the applications of composites in automotive and air craft industries (two each).   (04 Marks)

OR

8 a. Enumerate the differences between soldering and brazing (any six).   (06 Marks)
   b. Explain the different flames of welding with sketches.   (06 Marks)
   c. List the applications of welding and soldering (two each).   (04 Marks)

Module-5

9 a. List the diserable properties of a good refrigerant (any six).   (06 Marks)
   b. Enumerate the uses of refrigerations (any 4).   (04 Marks)
   c. Explain : i) COP   ii) Ton of refrigeration   iii) Types of refrigerant (any four).   (06 Marks)

OR

10 a. With a neat sketch explain vapour absorption refrigeration.   (08 Marks)
    b. Explain the construction and working of room air condition with neat sketch.   (08 Marks)

* * * * *

CBCS SCHEME

First/Second Semester B.E. Degree Examination, June/July 2018
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 role of civil engineer in the infrastructural development.   **(08 Marks)**
    b. Define Couple and Mention its characteristics.   **(06 Marks)**
    c. Find the moment of 500N force about point A, B, C and D as shown in fig. Q1(c).   **(06 Marks)**

Fig.Q1(c)

OR
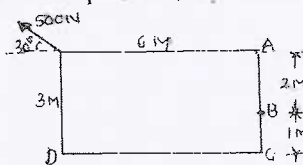
2   a. State and explain basic idealization in mechanics.   **(08 Marks)**
    b. Explain the following bridges with neat sketches :
       i) Suspension bridge   ii) Arch bridge.   **(06 Marks)**
    c. In the triangle ABC, a force at 'A' produces a clockwise moment of 90kN-m at B and an anticlockwise moment of 45kN-m at C. Find the magnitude and direction of the force as shown in fig.Q2(c).   **(06 Marks)**

Fig.Q2(c)
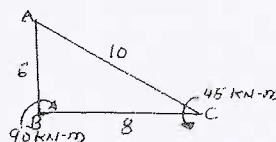
Module-2

3   a. State and prove Lami's theorem. Also write the significance of the law.   **(10 Marks)**
    b. Four forces acting on the gusset plate of a joint in a bridge truss are shown in fig. Q3(b). Determine the value of 'P' and 'θ' to maintain the equilibrium of the joint.   **(10 Marks)**

Fig.Q3(b)
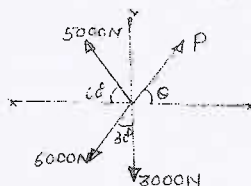
OR

4   a. State the laws of Static friction.   **(04 Marks)**
    b. Define i) Angle of friction   ii) Coefficient of friction   iii) Cone of friction.   **(06 Marks)**
    c. Determine the reactions at contact points for spheres A, B and C as shown in fig.Q4(c). It is given that $W_A = W_B = 4kN$, $W_C = 6kN$, $d_A = d_B = 500mm$, $d_C = 800mm$.   **(10 Marks)**

Fig.Q4(c)
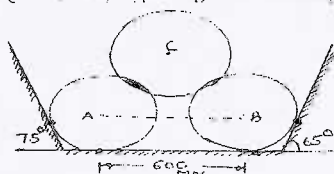
Module-3

5 a. State and prove Varignon's theorem of moment. (10 Marks)
b. Determine the reactions at the support for the beam as shown in fig. Q5(b). (10 Marks)

Fig.Q5(b)
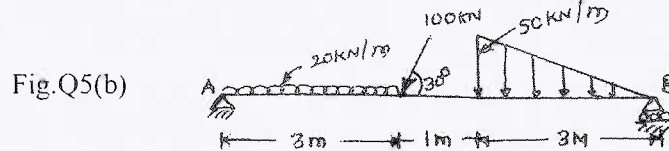
OR

6 a. Explain briefly with neat sketch : (10 Marks)
   i) Types of load   ii) Types of support   iii) Types of beams.
b. Determine the resultant of the force system acting on a body as shown in fig. Q6(b). Also locate the position of the resultant with respect to point 'D'. (10 Marks)

Fig.Q6(b)
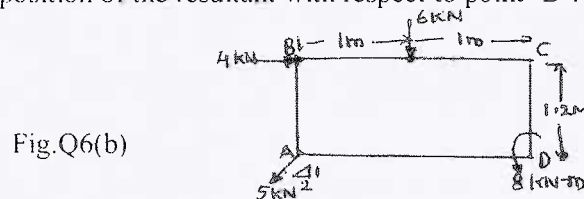
Module-4

7 a. State and prove Parallel Axis theorem. (08 Marks)
b. With reference to the co-ordinate axis X and Y, locate the centroid of an area as shown in fig. Q7(b). (12 Marks)

Fig.Q7(b)

OR
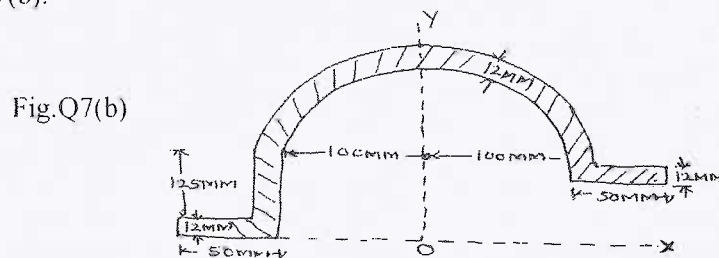
8 a. Determine the centroid of a triangular lamina about its base by method of integration. (08 Marks)
b. Determine the moment of inertia of the section shown in fig. Q8(b) about its centroidal axis. Calculate the least radius of gyration for the section. (12 Marks)

Fig.Q8(b)

2 of 3
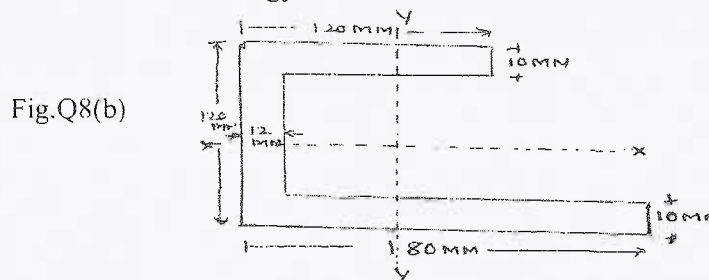
Module-5

9 a. Determine the position at which the ball is thrown up the plane will strike the inclined plane as shown in fig. Q9(a). The initial velocity is 30m/sec and the angle of projection is $\tan^{-1}\left(\frac{4}{3}\right)$.

(10 Marks)

Fig.Q9(a)
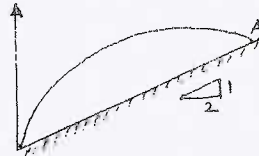
b. A Burglar's car starts at an acceleration of 2m/sec². A police vigilant party came after 5 seconds and continued to chase the Burglar's car with a uniform velocity of 20m/sec. Find the time taken in which the police van will overtake the car. (10 Marks)

OR

10 a. What is a Projectile? Define the following terms briefly : (10 Marks)
   i) Angle of projection   ii) Horizontal range   iii) Vertical height   iv) Time of flight.

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

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐   15CIV13/23

First/Second Semester B.E. Degree Examination, June/July 2018
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks: 80

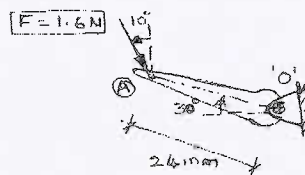**Note:** *Answer any FIVE full questions, choosing one full question from each module.*

Module-1

1   a.   Write a note on scope of water resources and irrigation engineering.   **(05 Marks)**
    b.   Write neat sketch with labels of a gravity dam and arch dam and explain their structural behaviour and functionality.   **(05 Marks)**
    c.   Explain with sketches, the principle of transmissibility and law of superposition.   **(06 Marks)**

OR

2   a.   Bring out comparison between flexible and rigid pavements highlighting their advantages and limitations.   **(05 Marks)**
    b.   What are different types of bridges? Explain any one type of bridge, with a neat sketch and label its parts.   **(05 Marks)**
    c.   Determine the moment of 1.6N force about the Pivot 'O' of the switch, shown in fig. Q2(c).   **(06 Marks)**

Fig.Q2(c)

Module-2

3   a.   State and explain the laws of static friction.   **(06 Marks)**
    b.   A barge is pulled by two tug boats as shown in fig. Q3(b). If the resultant of the forces exerted by tug boats is 25kN directed along the axis of barge, determine i) Tension in each of ropes, knowing that $\alpha = 45^0$ ii)   The value of α such that the tension is rope B is minimum.   **(10 Marks)**

Fig.Q3(b)

OR

4   a.   State the law of Parallelogram of forces.   **(02 Marks)**
    b.   Cable AB passes over a small frictionless pulley 'C' as shown in fig.Q4(b). What length of cable CD is required for static equilibrium in the position shown? Also find the tension T in cable CD.   **(06 Marks)**

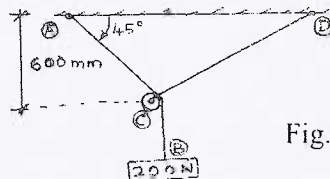
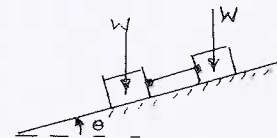Fig.Q4(b)   Fig.Q4(c)

    c.   Two blocks of equal weight rest on an inclined plane as shown in fig.Q4(c) and are connected by a string as shown. If the coefficient of friction of left side block and incline is $\mu_1 = 0.2$ and that of other block and incline is $\mu_2 = 0.3$, find the angle of inclination of the plane for which sliding will be impending. Assume weight of each block W = 22.25N.   **(08 Marks)**

Module-3

5   a.   Explain different types of reactions from various supports.   (04 Marks)

     b.   Explain and show how the moment of following loads are calculated with sketch :
       i)   Uniformly distributed load and   ii)   Uniformly varying load.   (04 Marks)

     c.   Four forces act on a 700mm × 350mm plate
       i)   Find the resultant of these forces   ii)   Locate the point of intersection of the line of
     action of resultant with edge AB of the plate shown in fig. Q5(c).   (08 Marks)

Fig.Q5(c)

OR

6   a.   State and prove Varignon's principle of Moments.   (04 Marks)

     b.   Explain the equilibrium conditions for Co – planar non – concurrent force system. (04 Marks)

     c.   A beam AB 11m long is hinged at A and supported on rollers over a smooth inclined at 45^0
     to horizontal at B. The beam is loaded as shown in fig. Q6(c). Determine the reactions at
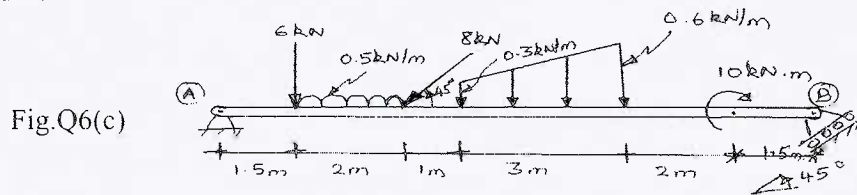   A and B.   (08 Marks)

Fig.Q6(c)

Module-4

7   a.   State and prove parallel axis theorem.   (06 Marks)

     b.   Determine the centroid for the shaded area shown in fig. Q7(b), with respect to 'O'.
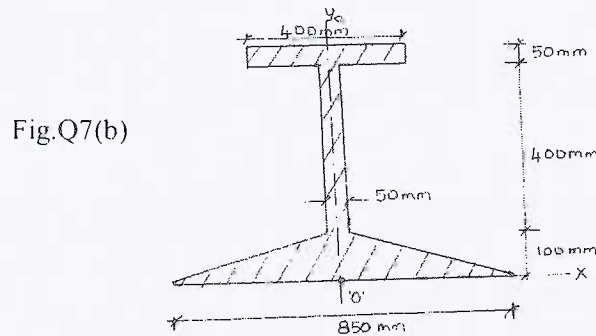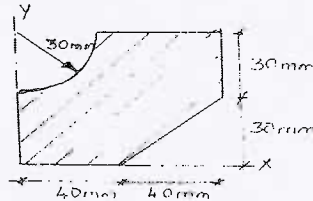   (10 Marks)

Fig.Q7(b)

OR

8   a.   Determine the centroid of the semi circular area of radius R with diametrical base placed
     along horizontal by first principle.   (04 Marks)

b. Determine moment of inertia of shaded area shown in fig. Q8(b) with respect to X & Y axis. Also determine radius of gyration. **(12 Marks)**

Fig.Q8(b)

Module-5

9 a. State Newton's laws of motion. **(03 Marks)**

b. Explain the term Super Elevation. **(03 Marks)**

c. A stone is dropped into a well and falls vertical with constant acceleration of $g = 9.81 m/s^2$. The sound of impact of stone on bottom of well is heard 6.5 seconds after it is dropped. If the velocity of sound is 336m/s, how deep is the well? **(10 Marks)**

OR

10 a. Explain the terms i) Displacement ii) Velocity iii) Acceleration. **(06 Marks)**

b. Two adjacent guns having the same velocity $V_o = 300$ m/s fire simultaneously at angles of elevation α_1 and α_2 with horizontal for the target at same range , r = 4500m. Calculate the time difference $t_2 - t_1$ between the two hits. **(10 Marks)**

* * * * *

USN [2 V D 1 6 C S 0 1 5] **15CIV13/23**

First/Second Semester B.E. Degree Examination, June/July 2018
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks: 80

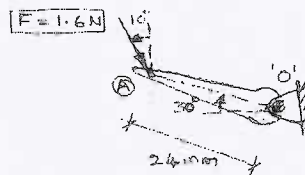**Note:** *Answer any FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Write a note on scope of water resources and irrigation engineering.   **(05 Marks)**
   b. Write neat sketch with labels of a gravity dam and arch dam and explain their structural behaviour and functionality.   **(05 Marks)**
   c. Explain with sketches, the principle of transmissibility and law of superposition.   **(06 Marks)**

OR

2 a. Bring out comparison between flexible and rigid pavements highlighting their advantages and limitations.   **(05 Marks)**
   b. What are different types of bridges? Explain any one type of bridge, with a neat sketch and label its parts.   **(05 Marks)**
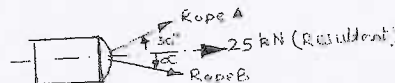   c. Determine the moment of 1.6N force about the Pivot 'O' of the switch, shown in fig. Q2(c).   **(06 Marks)**

Fig.Q2(c)

Module-2

3 a. State and explain the laws of static friction.   **(06 Marks)**
   b. A barge is pulled by two tug boats as shown in fig. Q3(b). If the resultant of the forces exerted by tug boats is 25kN directed along the axis of barge, determine i) Tension in each of ropes, knowing that $\alpha = 45^0$ ii)   The value of α such that the tension is rope B is minimum.   **(10 Marks)**

Fig.Q3(b)

OR

4 a. State the law of Parallelogram of forces.   **(02 Marks)**
   b. Cable AB passes over a small frictionless pulley 'C' as shown in fig.Q4(b). What length of cable CD is required for static equilibrium in the position shown? Also find the tension T in cable CD.   **(06 Marks)**
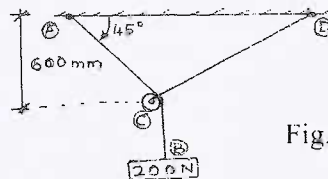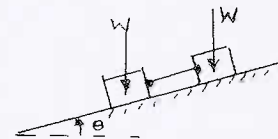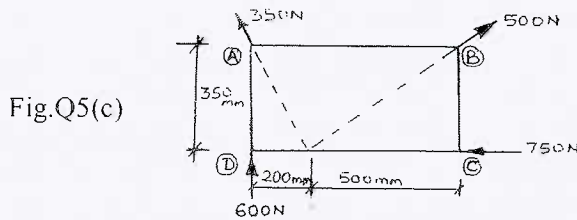

Fig.Q4(b)

Fig.Q4(c)

   c. Two blocks of equal weight rest on an inclined plane as shown in fig.Q4(c) and are connected by a string as shown. If the coefficient of friction of left side block and incline is $\mu_1 = 0.2$ and that of other block and incline is $\mu_2 = 0.3$, find the angle of inclination of the plane for which sliding will be impending. Assume weight of each block W = 22.25N.   **(08 Marks)**
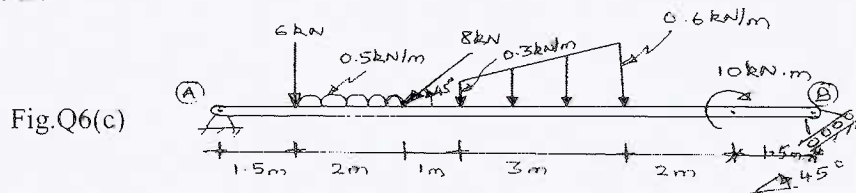
Module-3

5   a. Explain different types of reactions from various supports.   (04 Marks)
    b. Explain and show how the moment of following loads are calculated with sketch :
        i) Uniformly distributed load and   ii) Uniformly varying load.   (04 Marks)
    c. Four forces act on a 700mm × 350mm plate
        i) Find the resultant of these forces   ii) Locate the point of intersection of the line of
        action of resultant with edge AB of the plate shown in fig. Q5(c).   (08 Marks)
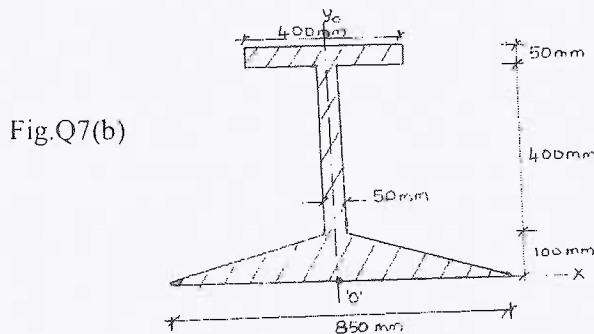
Fig.Q5(c)

OR

6   a. State and prove Varignon's principle of Moments.   (04 Marks)
    b. Explain the equilibrium conditions for Co – planar non – concurrent force system. (04 Marks)
    c. A beam AB 11m long is hinged at A and supported on rollers over a smooth inclined at 45^0
        to horizontal at B. The beam is loaded as shown in fig. Q6(c). Determine the reactions at
        A and B.   (08 Marks)

Fig.Q6(c)

Module-4

7   a. State and prove parallel axis theorem.   (06 Marks)
    b. Determine the centroid for the shaded area shown in fig. Q7(b), with respect to 'O'.
                                                                                      (10 Marks)

Fig.Q7(b)

OR

8   a. Determine the centroid of the semi circular area of radius R with diametrical base placed
        along horizontal by first principle.   (04 Marks)

First/Second Semester B.E. Degree Examination, June/July 2018
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least ONE question from each part.

Module-1

1 a. Explain the role of civil engineer in the infrastructural development of a country. **(10 Marks)**

   b. Determine the components of the force F = 1500N along A – A and B – B axes. Refer Fig.Q1(b). **(05 Marks)**
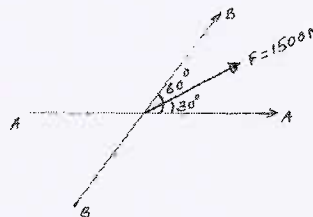

Fig.Q1(b)

   c. Replace the horizontal 600N force acting on the lever as shown on Fig.Q1(c) by an equivalent force-couple system to act at 0. **(05 Marks)**
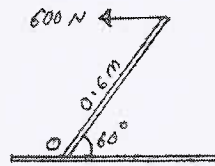

Fig.Q1(c)

2 a. Discuss classification of roads based on material of construction and based on Nagpur road plan. **(10 Marks)**

   b. A square ABCD has forces acting along its sides as shown in Fig.2(b). Find the values of P and Q, if the system reduces to a couple. Also find the magnitude of the couple if the side of the square is 2m. **(05 Marks)**
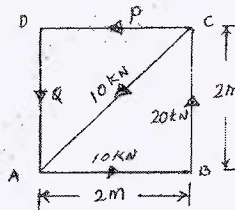

Fig.Q2(b)

   c. Find the moment of 1000N force about points A, B, C and D as shown in Fig.Q2(c). **(05 Marks)**
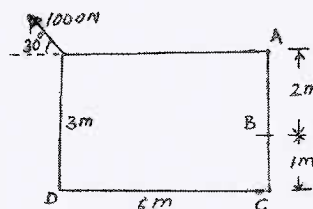

Fig.Q2(c)

1 of 4

Module-2

3 a. Define the following :
   i) Resultant
   ii) Law of parallelogram of forces
   iii) Principle of resolved parts
   iv) Composition of forces
   v) Coplanar concurrent system. **(10 Marks)**

  b. Determine the magnitude, direction and position of the resultant along AB for the given system of forces shown in Fig.Q3(b). **(10 Marks)**
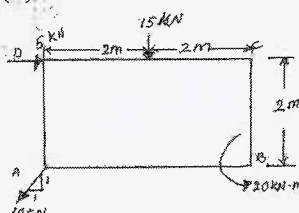

Fig.Q3(b)

4 a. State and prove Varignon's principle of moment. **(08 Marks)**

  b. Two cables which have known tensions are attached to the top of pylon AB as shown in Fig.Q4(b). A third cable AC is used as a guy wire. Determine the tension in AC knowing that the resultant of the forces exerted at A by the three cables must be vertical. **(06 Marks)**
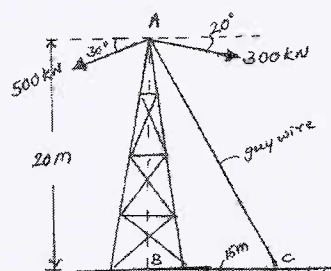
Fig. Q4(b)

  c. Two forces of magnitude P and Q act at a point on a body. When the angle between the forces is 90°, their resultant is $\sqrt{1000}N$. When the angle between forces is 60°, their resultant is $\sqrt{1300}N$. Determine the value of P and Q. **(06 Marks)**

Module-3

5 a. Two smooth spheres each of radius 100mm and weight 200N rests in a channel as shown in Fig.Q5(a), Determine the normal reactions at points A, B and C on the channel. **(10 Marks)**

Fig.Q5(a)

  b. A beam ABCDEF is hinged at A, supported on rollers at E and carries loads as shown in Fig.Q5(b). Determine the reactions at the supports. **(10 Marks)**

Fig.Q5(b)

6 a. State Columb's laws of dry friction.   (04 Marks)
   b. A block of weight 2000N is resting on an inclined plane which is inclined to horizontal at an angle of 45°. The block is connected by means of a string which passes over a frictionless pulley and to 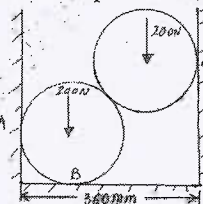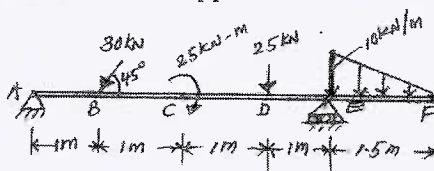which an effort P is hung freely. Determine the minimum and maximum values of P for which the system is in equilibrium. The co-efficient of friction between the surfaces of contact is 0.25. Refer Fig.Q6(b).   (08 Marks)
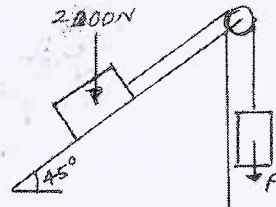
Fig.Q6(b)

   c. A uniform beam AB hinged at A, is kept horizontal by supporting and settling a 400N weight with the help of a string tied at B and passing over smooth pulley at C. The bar weighs 200N. Determine the reactions at the support A and tension in the string. Refer Fig.Q6(c).   (08 Marks)
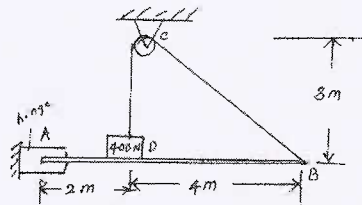
Fig.6Q(c)

Module-4

7 a. State and prove parallel axis theorem.   (08 Marks)
   b. Determine the Centriod of the concrete dam shown in Fig.Q7(b) with reference to given x and y axis.   (12 Marks)
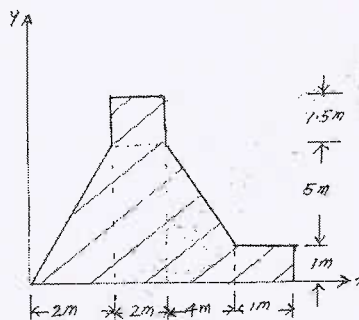
Fig.Q7(b)

8 a. From first principles, determine the centriod of a semicircular area.   (08 Marks)
   b. Find the moment of inertia of the section shown in Fig.Q8(b) about the centriodal x-x axis and y-y axis.   (12 Marks)
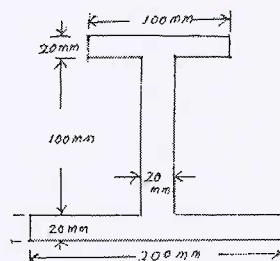
Fig.Q8(b)
3 of 4

Module-5

9 a. What is a projectile? Define the following terms briefly with general equations where-ever possible i) Angle of projection ii) Time of flight iii) Horizontal range iv) maximum height attained by the projectile. **(10 Marks)**

b. A bullet moving at the rate of 300m/sec is fired into a thick wood penetrates up to 500mm. If it is fired into a 250mm thick target, find the velocity of emergence. Take the resistance to be uniform in both the cases. **(10 Marks)**

10 a. A particle, starting form rest, moves in a straight line, whose equation of motion is given by $S = 5t^3 - 3t^2 + 6$. Find the displacement, velocity and acceleration of the particle after 5 seconds. S is in meters. **(04 Marks)**

b. A particle is projected in air with a velocity of 120 m/sec at an angle of 30° with the horizontal. Determine : i) the horizontal range ii) maximum height reached by the particle and iii) the time of flight. **(08 Marks)**

c. A stone is dropped from the top of a building 100m high. At the same time another stone is thrown upwards from the foot of the building with a velocity of 50m/sec. When and where the two stones cross each other? **(08 Marks)**

* * * * *

CBCS Scheme

USN ☐☐☐☐☐☐☐☐☐☐   15CPH18/28

First/Second Semester B.E Degree Examination, June/July 2018

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 famous Dandi March done by Gandhiji was against
   a) British Rule   b) Salt Tax   c) Sati system   d) Untouchability

2. The name of Dr. B. R. Ambedkar is associated with which of the following?
   a) Chairman-Drafting committee   b) Chairman Constituent Assembly
   c) Lahore session   d) Indian National Congress

3. The beginning word "WE" in the preamble refers to the
   a) British rulers   b) Members of Constituent Assembly
   c) Citizens of India   d) All of these

4. In our constitution, what justice is not given to the citizens?
   a) Social   b) Economic   c) Political   d) Technical

5. India borrowed the idea of incorporating fundamental rights in the constitution from
   a) USA   b) France   c) China   d) Great Britain

6. Which of the following is not a fundamental right? (Right to)
   a) Assemble peacefully   b) Move freely
   c) Property   d) Constitutional Remedies

7. This is not a Writ.
   a) Habeas Corpus   b) Mandamus   c) Certiorari   d) Prevention

8. Conflict of interest may be
   a) false   b) potential   c) created   d) imaginary

9. The directive principles of state policy are _____ rights.
   a) social   b) political   c) constitutional   d) legal

10. Which part of the constitution aims at establishing a welfare state in the country?
    a) Preamble   b) Fundamental rights
    c) Fundamental duties   d) directive principles

11. Respecting our National Flag is a
    a) fundamental right   b) directive principles
    c) fundamental duty   d) none of these

12. The obligation of the parents/guardian to provide opportunities for the education to their children between 6 to 14 years of age is
    a) fundamental duty   b) fundamental right
    c) directive principle   d) none of these

13. Which of the following is considered as the 'Fourth Estate'?
    a) Assembly   b) Press   c) Council   d) Parliament

14. The President of India is
    a) selected   b) nominated   c) appointed   d) elected

15. The commander-in-chief of all the Armed Forces is the
    a) President   b) Vice President   c) Prime Minister   d) Field Marshall

16. Which Budget will be proposed first in the parliament house?
    a) general budget   b) financial   c) railway   d) vote of credit

17. Who acts as the channel of communication between the president and council of ministers?
    a) Speaker of Lok Sabha   b) Prime Minister
    c) Deputy Prime Minister   d) Senior-most minister

18. Who interprets the Indian Constitution?
    a) President   b) Parliament   c) Founding fathers   d) Supreme court

19. What is the minimum age in years for becoming the MLC and MLA in the state?
    a) 30 and 25   b) 35 & 30   c) 40 & 35   d) 45 & 40

20. 'Bicameral' means 'presence of' _____ in the state.
    a) half house   b) one house   c) two houses   d) no house

2 of 4

21. Salaries and other emoluments of the high court judges shall be determined by the
   a) state legislative   b) parliament   c) governor   d) chief minister

22. Constitution empowers state governments to make special law for
   a) women and children   b) workers working in mines
   c) farmers   d) unemployed youth

23. What is the minimum gap permissible between the two sessions of the legislature?
   a) six weeks   b) two months   c) three months   d) six months

24. Who is competent to declare the elections to the Lok Sabha?
   a) Election Commissioner   b) President
   c) Prime Minister   d) Union Cabinet

25. Election disputes shall be decided by
   a) parliament   b) supreme court   c) election commission   d) president

26. Regional Election commissioners may be appointed by the president with the consultation of
   a) election commission   b) governor
   c) Prime Minister   d) Vice President

27. Village Panchayats are the best examples for India's _____ form of Government.
   a) republican   b) sovereign   c) secular   d) democratic

28. In which one of the following states is it constitutionally obligatory for the state to have a separate minister for Tribal Welfare?
   a) Bihar   b) Madhya Pradesh   c) Odisha   d) all of these

29. _____ is empowered to declare an emergency.
   a) Supreme court   b) President
   c) Prime minister   d) Council of minister

30. This is not a ground to declare state emergency.
   a) No clear majority
   b) Failure to maintain law and order in state
   c) Disobeying the direction given by the supreme court
   d) Not complying with the direction given by the union government

31. 'Panchayati Raj' literally means that the governance by _____ individuals.
   a) three   b) four   c) five   d) six

32. Every year, Human Rights Day will be observed on
   a) 10th September   b) 10th October
   c) 10th November   d) 10th December

33. The slogan adopted for 50th Anniversary of Universal Declaration of Human Rights is
    a) all human rights for all
    b) all rights for all
    c) all fundamental rights for all
    d) none of these

34. The formula of a soft drink is an example of
    a) patent
    b) trade secret
    c) copyright
    d) trade mark

35. This is not a kind of trade mark.
    a) symbol
    b) sound
    c) design
    d) goodwill

36. Which of the following does not depict the attitude towards responsibility?
    a) protest
    b) minimalist
    c) reasonable care
    d) good works

37. Tendency of shifting responsibility will logically come down if there is
    a) microscopic vision
    b) fear
    c) group thinking
    d) none of these

38. The owner of 'Patent right' retains his/her patent right for _____ years.
    a) 100
    b) 75
    c) 50
    d) 20

39. Which of the following is not preserved as an intellectual property?
    a) copy right
    b) government regulation
    c) patent
    d) trade secret

40. This is not the aim of studying engineering ethics.
    a) crimping
    b) cooking
    c) forging
    d) plagiarism

* * * * *

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Explain the following fields of Civil Engineering in brief :
         i) Structural Engineering   ii) Transportation Engineering.   (05 Marks)
    b.   With neat sketches, explain any two types of dams.   (05 Marks)
    c.   Two forces act at an angle of 120^0. The bigger force is 4000N and the resultant is
         perpendicular to the smaller force. Find the smaller force. Refer fig. Q1(c).   (05 Marks)

Fig.Q1(c)
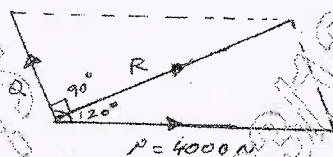
   d.   Determine the moment of force 5KN about A as shown in fig. Q1(d).   (05 Marks)

Fig.Q1(d)
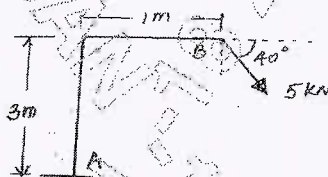
OR

2   a.   Explain role of civil engineers in the infrastructural development of a country.   (06 Marks)
    b.   Give comparison of flexible and rigid pavements.   (04 Marks)
    c.   A 100N vertical force is applied to the end of a lever which is attached to a shaft as shown in
         fig.Q2(c). Determine   i) the moment of force about O.
         ii)   the horizontal force applied at A which creates same moment about O.
         iii) the smallest force applied at A which creates same moment about O.   (10 Marks)

Fig.Q2(c)
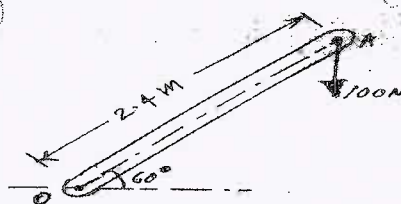
Module-2

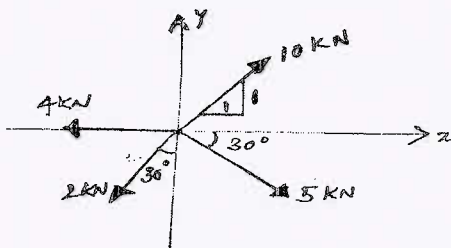3   a.   What is resultant? Explain the steps involved in finding the magnitude and direction of
         resultant of concurrent co-planer system of forces.   (05 Marks)
    b.   Determine the magnitude and direction of resultant of concurrent co-planar system of forces
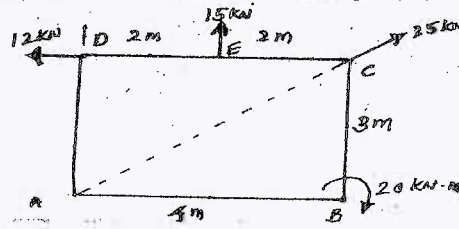   shown in fig. Q3(b).   (06 Marks)

Fig.Q3(b)

c. Determine the magnitude, direction and position of resultant from A on x-axis for the given non concurrent co-planar system of forces shown in fig. Q3(c). **(09 Marks)**
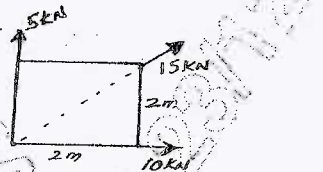

Fig.Q3(c)

OR

4 a. State and prove law of parallelogram of forces. **(06 Marks)**

b. Three force of magnitude 10kN, 15kN and 5kN are acting on a square as shown in fig. Q4(b). Determine the magnitude and direction of their resultant. **(04 Marks)**

Fig.Q4(b)

c. Determine the magnitude, direction and position of resultant from A along x axis of the system of forces shown in fig. Q4(c). **(08 Marks)**

Fig.Q4(c)
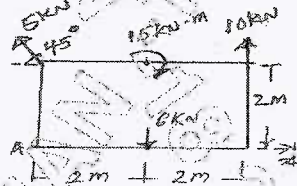
d. State Verignon's principle of Moments. **(02 Marks)**

Module-3

5 a. State and prove Lami's theorem. **(06 Marks)**

b. A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 100N at the free end as shown in fig. Q5(b). If in the position of equilibrium, BC is horizontal and AB and CD makes 150^0 and 120^0 with BC find i) Tension in the portions AB, BC and CD of the string. ii) Magnitudes of W_1 and W_2. **(07 Marks)**

Fig.Q5(b)
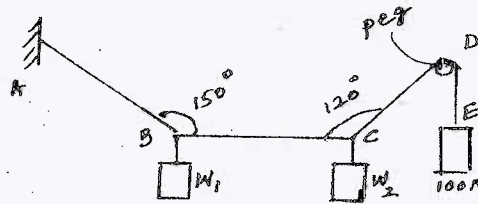
c. Determine the support reactions for the beam shown in fig.Q5(c). **(07 Marks)**

Fig.Q5(c)
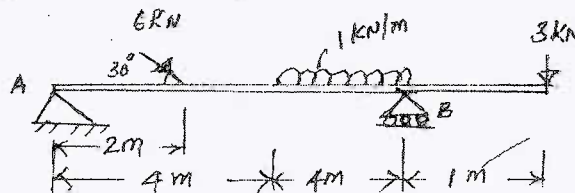
OR

6 a. A circular roller weighing 5000N having radius of 200mm, hangs by a string AC 200mm long as shown in fig. Q6(a). Find the tension in the string and the reaction of the wall.

(05 Marks)

Fig.Q6(a)
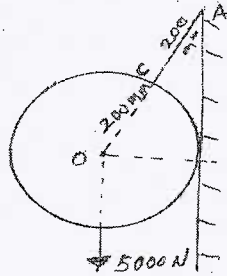
b. A wooden beam weighing 200N/m is supported on a hinged end at A and by a cable CD as shown in fig. Q6(b). It carries a point load of 400N at B. Determine the reaction at A.

(06 Marks)

Fig.Q6(b)
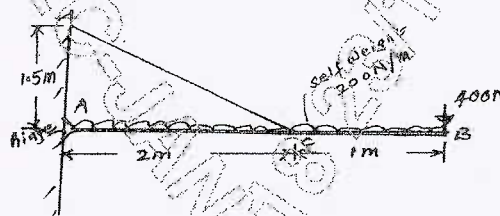
c. A block weighing 4000N is resting on horizontal surface supports another block of 2000N as shown in fig. Q6(c). Find the horizontal force F just to move the block to the left. Take co-efficient of friction for all surfaces of contact to be 0.2.

(09 Marks)

Fig.Q6(c)
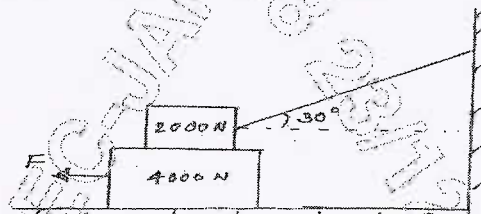
Module-4

7 a. From first principle derive the expression for centroid of a triangle.   (06 Marks)
   b. Define the following : i) Axis of reference   ii) Axis of symmetry.   (04 Marks)
   c. Determine the moment of inertia of the plane lamina shown in fig. Q7(c) about base AB.

(10 Marks)

Fig.Q7(c)
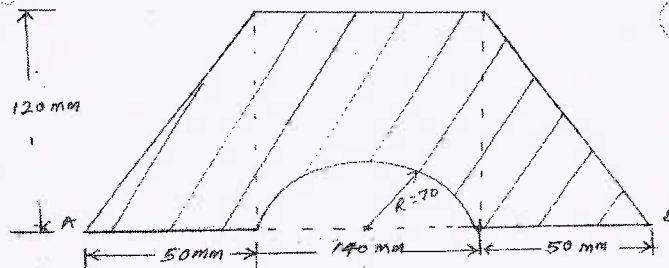
OR

8 a. State and prove perpendicular axis theorem.   (05 Marks)
   b. From first principle derive the equation for moment of inertia of a circle about centroidal axis.   (05 Marks)

3 of 4

c. Find the centroid of shaded area from reference x and y axis respectively. Refer fig. Q8(c). (10 Marks)

Fig.Q8(c)
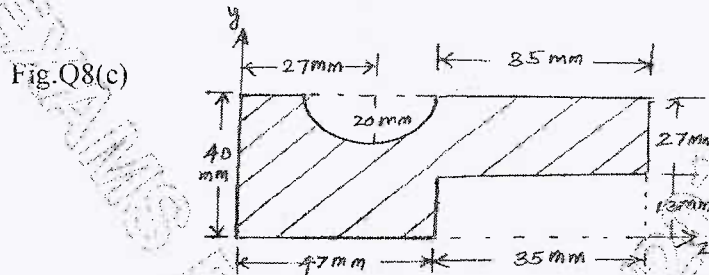
Module-5

9 a. Define the following terms : i) Velocity   ii) Acceleration. (04 Marks)

b. An electric train, travelling between two stations 2.0km apart is uniformly accelerated for the first 20 seconds, during which period it covers 200m. It then runs with a constant speed, until it is finally retarded uniformly in the last 150m. Find the maximum speed of the train and the time taken to complete the journey between the two stations. (09 Marks)

c. An aircraft moving horizontally at a speed of 720kmph at a height of 1000m towards a target on the ground , releases a bomb which hits the target, find (07 Marks)
   i) Time required for the bomb to reach the target on the ground and
   ii) The horizontal distance of the air-craft from the target when it released the bomb.

OR

10 a. A vehicle is moving with variable acceleration and its motion is given by the equation $S = 25t + 4t^2 - 6t^3$, where s is in m and t is in seconds. Determine :
   i) the velocity and acceleration at start.
   ii) the time when the vehicle reaches its maximum velocity.
   iii) the maximum velocity of the vehicle. (05 Marks)

b. A ball is dropped from the top of a skyscraper building which is 150m high. After 1 second, another stone is thrown down and strikes the first ball when it has just reached the foot of the building. Find the velocity with which the second ball was thrown. (07 Marks)

c. A motorcyclist wants to clear the ditch shown in fig.Q10(c). If the ramp at B is of 25^0, determine the maximum speed of the motorcyclist at B. Motorcycle may be treated as a particle. (08 Marks)

Fig.Q10(c)
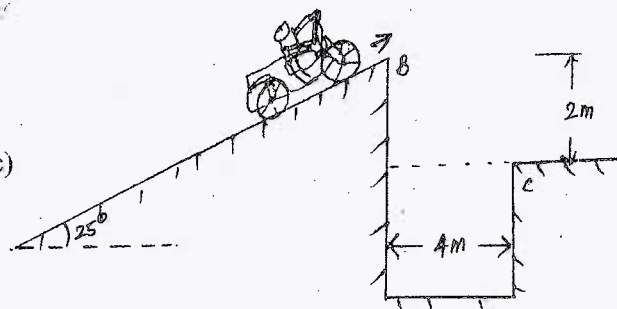
* * * * *

CBCS Scheme

USN ☐☐☐☐☐☐☐☐☐☐

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
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. Name different fields of civil engineering and explain any two of them.   (06 Marks)
   b. With neat sketch, explain any two types of dams.   (06 Marks)
   c. Find the moment of 500N force about points A, B. C and D as shown in Fig.Q1(C).
                                                                                       (04 Marks)

OR

2 a. Explain the role of civil engineer in infrastructural development of the country.   (06 Marks)
   b. Explain the Nagpur road plan classification.   (06 Marks)
   c. A square ABCD has forces acting along its sides as shown in Fig.Q2(c). Find the value of P
      and Q, if the system reduces to a couple. Also find magnitude of the couple if the side of the
      square is 2m.   (04 Marks)

Module-2

3 a. State and prove parallelogram law of forces.   (06 Marks)
   b. The forces acting on the system are shown in Fig.Q2(b). Determine the magnitude and
      direction of the resultants.   (06 Marks)
   c. With neat sketches explain angle of friction, angle of repose and cone of friction. (04 Marks)

OR

4 a. State laws of dry friction.   (04 Marks)
   b. A chord supported at A and B carries a load of 100kN at D and a load of W at C as shown in
      Fig.Q4(b). Find the values of W so that CD remains horizontal. Also determine tension in
      each chord.   (06 Marks)
   c. A block weighing 4000N is resting on horizontal surface supports another block of 2000N as
      shown in Fig.Q4(c). Find the horizontal force F just to move the block to the left. Take co-
      efficient of friction for all surfaces of contact to be 0.2.   (06 Marks)

Module-3

5 a. State and prove Verignon's principle of moments.   (06 Marks)
   b. A rigid plat is subjected to the forces as shown in Fig.Q5(b). Compute magnitude direction
      and position of resultant force with respect to centroid point O of the plate.   (06 Marks)
   c. Determine the support reactions for the beam shown in Fig.Q5(c).   (04 Marks)

1 of 3

OR

6   a.   With neat sketches indicating the reactions explain types of supports.   (04 Marks)

   b.   The forces acting on 1m length of a dam are as shown in Fig.Q6(b). Determine the magnitude, direction and position of resultant from O.   (06 Marks)

   c.   A uniform beam AB hinged at A, is kept horizontal by supporting and settling a 400kN with the help of a rope tied at B and passing over smooth pulley at C. The bar weights 200kN. Determine the reactions at the supports A and C as well as the tension in the string. Refer Fig.Q6(c).   (06 Marks)

Module-4

7   a.   State and prove parallel axis theorem.   (05 Marks)

   b.   From first principles determine the centroid of a rectangle.   (05 Marks)

   c.   Determine the centroid of the area shown in Fig.A7(c) with respect to the axis shown.   (06 Marks)

OR

8   a.   From first principles determine the centriod of quarter circle.   (06 Marks)

   b.   Determine the moment of inertia of the symmetric I section shown in Fig.Q8(b) about its centriodal x – x axis and y – y axis. Also determine polar moment of inertia.   (10 Marks)

Module-5

9   a.   Derive the expression for maximum height attained by the projectile.   (05 Marks)

   b.   A car starts from rest and accelerates uniformly to a speed of 75 kmph over a distanced of 1000M. Find acceleration of the car and time taken to attain this speed. If a further acceleration rises the speed to 100kmph in 10sec, find the new acceleration and the further distance moved.   (05 Marks)

   c.   The equation of motion of particle is given by $a = 4t^3 - 3t^2 + 6$ where a : acceleration in m/sec^2 and t : time in seconds. The velocity of the particle at t = 1 second is 5.0 m/sec and displacement is 10m. Determine the displacement and velocity at t = 5 seconds.   (06 Marks)

OR

10   a.   What is super elevation? Explain the objects of providing super elevation.   (04 Marks)

   b.   A ball was thrown vertically upwards from the ground with the velocity of 60m/sec. After 3 seconds another ball was thrown vertically upwards from the ground. If both the balls strike the ground at the same time, determine the velocity with which the second ball was thrown.   (06 Marks)

   c.   A particle is projected in air with a velocity of 120m/sec at an angle of 30° with the horizontal. Determine :
      i)   The horizontal range
      ii) Maximum height attained by the particle
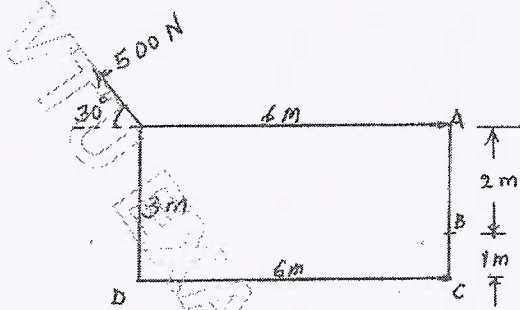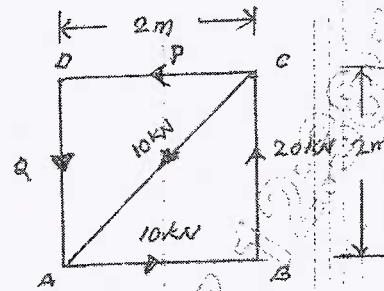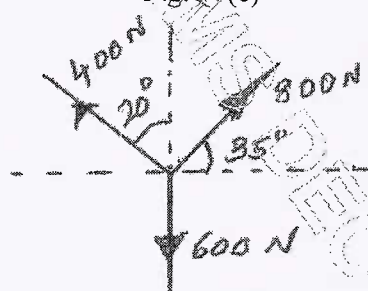   iii) The time of flight.   (06 Marks)

Fig.Q1(c)

Fig.Q2(c)

Fig.Q3(b)
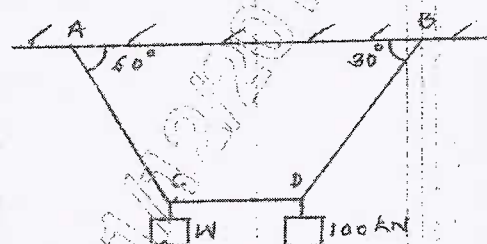
Fig.Q4(b)
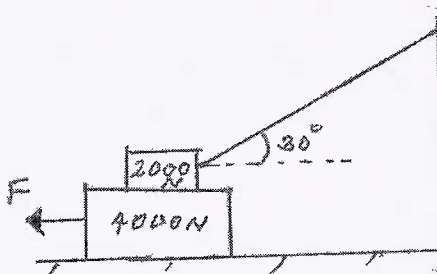
Fig.Q4(c)
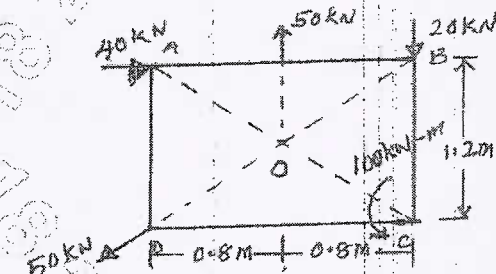
Fig.Q5(b)
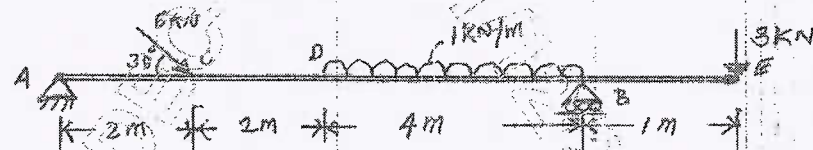
Fig.Q5(C)
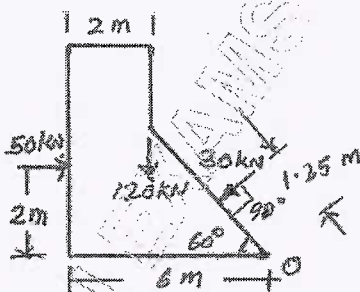
Fig.Q6(b)
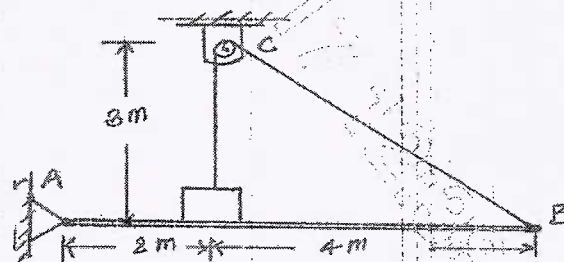
Fig.Q6(c)

Fig.Q7(c)

Fig.Q8(b)

* * * 2 of 2 * * *
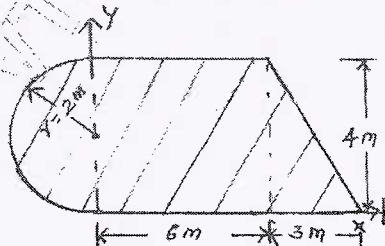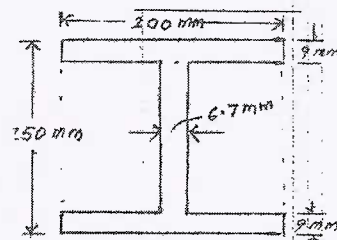
USN ☐☐☐☐☐☐☐☐☐☐

17CIV13

First Semester B.E. Degree Examination, Dec.2017/Jan.2018
Elements of Civil Engineering & Mechanics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Briefly give the scope of different fields in Civil Engineering. (10 Marks)
   b. List and briefly explain the types of force systems with example. (10 Marks)

OR

2 a. Write the classification of roads and comparison of flexible and rigid pavements. (10 Marks)
   b. The moment of certain force 'F' is 180 kN-m clockwise about 'O' and 90kN-m counter clockwise about 'B'. If its moment about 'A' is zero, determine the force 'F'. Refer fig.Q2(b). (10 Marks)

Fig.Q2(b)

Module-2

3 a. State and prove Parallelogram law of forces and also write the significance of the law. (10 Marks)
   b. In the fig. Q3(b) the portion BC of the string is horizontal and pulley is frictionless. Determine tensions in different segments of the string. Also find W1 and W2. Use Lami's theorem. (10 Marks)

Fig.Q3(b)
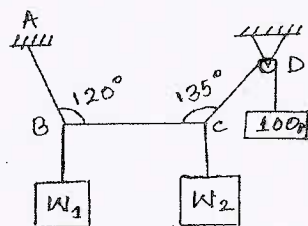
OR

4 a. Define the terms : i) Angle of friction   ii) Cone of friction. (04 Marks)
   b. What should be the value of θ if fig. Q4(b) which will make the motion of 900N block down the plane to impend? The coefficient of friction for all contact surfaces is 1/3. (06 Marks)

Fig.Q4(b)
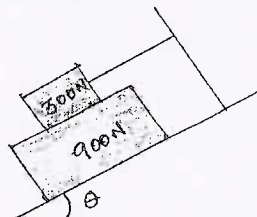
1 of 3

c. Two forces P & Q are acting at point 'O' as shown in fig. Q4(c). the resultant force is 400N, angles β and γ are 35⁰ and 25⁰ respectively. Find the two forces P and Q. **(10 Marks)**
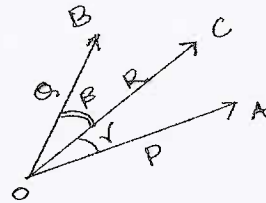
Fig.Q4(c)

Module-3

5 a. Explain i) Types of loads ii) Types of support. **(10 Marks)**

   b. A roller weighing 2000N rests on an inclined bar, which is 5m long and weighing 800N as shown in fig. Q5(b). Determine the reactions developed at supports C and D. **(10 Marks)**
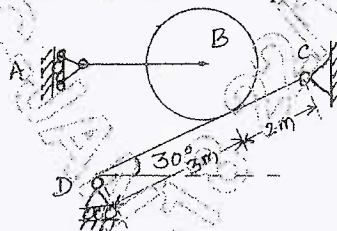
Fig.Q5(b)

OR

6 a. State and prove 'Principle of Moments'. **(10 Marks)**

   b. Determine the reactions at the supports for the beam loaded as shown in fig. Q6(b). **(10 Marks)**
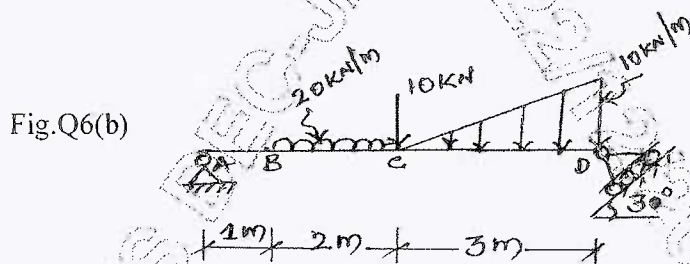
Fig.Q6(b)

Module-4

7 a. Determine the centroid of a right angle triangle of base 'b' and height 'h' from first principle. **(08 Marks)**

   b. Determine the centroid of the area shown in fig. Q7(b) with respect to the axes shown. **(12 Marks)**

Fig.Q7(b)

OR

2 of 3
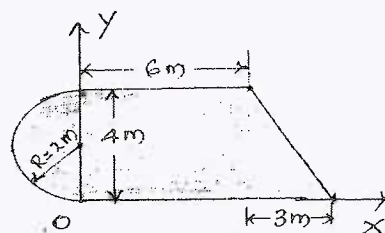
8 a. Determine the moment of Inertia of a circle about its diametral axis by the method of integration. **(06 Marks)**

   b. Determine the moment of inertia of the section shown in fig. Q8(b) about the Vertical Centroidal axis. All dimensions are in mm. **(14 Marks)**

Fig.Q8(b)
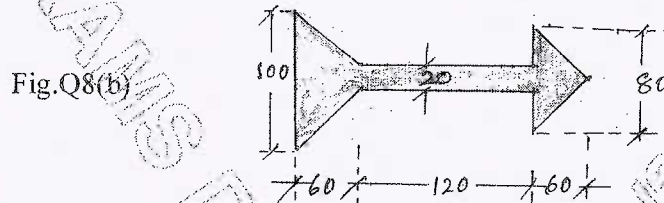
Module-5

9 a. State and explain Newton's laws of motion. **(10 Marks)**

   b. On a straight road, a smuggler's car passes a police station with uniform velocity of 10m/sec. After 10 secs, a police van follows in pursuit with a uniform acceleration of 1m/sec². Find the time necessary for the police van to catch up with the smuggler's car. **(10 Marks)**

OR

10 a. What is Projectile? Define the terms i) Angle of projection ii) Horizontal range. **(06 Marks)**

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

   c. Find the least initial velocity with which a projectile is to be projected so that it clears a wall of 4m height located at a distance of 5m, and strikes the ground at a distance 4m beyond the wall as shown in fig. Q10(c). The point of projection is at the same level as the foot of the wall. **(10 Marks)**

Fig.Q10(c)

* * * * *
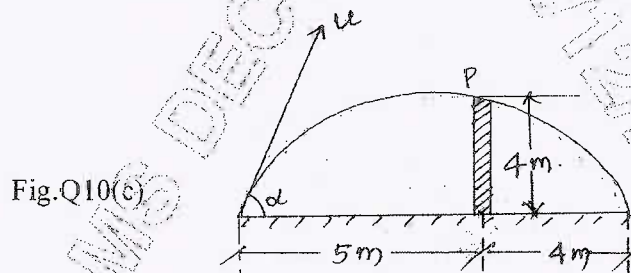
USN | | | | | | | | | |

15EME14/24

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Element of Mechanical Engineering

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1 a. Differentiate between conventional and Non conventional energy sources. (04 Marks)
   b. Define Higher calorific value (HCV) and lower calorific value (LCV) of a fuel. (04 Marks)
   c. Explain with a neat sketch working of a wind mill. (08 Marks)

OR

2 a. Explain the terms:
       i)   Dry saturated steam
       ii) Wet steam
       iii) Superheated steam
       iv) Degree of superheat. (04 Marks)
   b. Define Boiler mountings and Boiler Accessories. (04 Marks)
   c. Explain with a sketch working of Babcock and Wilcox Boiler. (08 Marks)

Module-2

3 a. Differentiate between working of open cycle and closed cycle Gas turbine. (04 Marks)
   b. How are IC engines classified? (04 Marks)
   c. Explain with a sketch working by simple impulse steam Turbine (De Laval Turbine). (08 Marks)

OR

4 a. Explain with a Pv diagram working of a four stroke Diesel engine. (08 Marks)
   b. A fair stroke diesel engine has a piston diameter of 250mm and stroke of 400mm. Mean effective pressure is 4Bar. Speed is 500 Rpm. Diameter of the Brake drum is 1m and effective Brake load is 400N. Determine Indicated power, Brake power and Frictional power. (08 Marks)

Module-3

5 a. Explain with sketch following operations on Lathe
       i) Knurling
       ii) Thread cutting. (06 Marks)
   b. Sketch and explain cylindrical co-ordinate Robot. (06 Marks)
   c. With a simple Block diagram, explain the element of NC machine. (04 Marks)

OR

6 a. Explain with sketch the following operations a Drilling Machine
       i) Counter Boring
       ii) Countersinking. (06 Marks)
   b. Explain with a sketch Polar configuration Robot. (06 Marks)
   c. What are the objectives of Automation? (04 Marks)

Module-4

7 a. Explain the composites properties and Application of cast Iron   (04 Marks)
   b. How are composites classified.   (04 Marks)
      Explain with a sketch working of electric Arc welding.   (08 Marks)

OR

8 a. What are the applications of composites in Automobile and Aerospace Industry?   (04 Marks)
   b. Differentiate between soldering, Brazing, Welding.   (04 Marks)
   c. Explain the process of
        i) Soldering
        ii) Brazing.   (08 Marks)

Module-5

9 a. Define :
        i) Refrigeration
        ii) Air conditioning   (04 Marks)
   b. List the commonly used Refrigerants.   (04 Marks)
   c. Explain with a sketch working of vapour absorption Refrigerating system.   (08 Marks)

OR

10 a. Differentiate between working of Vapour compression and vapour absorption Refrigerating
      system.   (04 Marks)
   b. Define the terms :
        i)   Refrigerant
        ii) Refrigerating effect
        iii) COP
        iv) ICE making capacity.   (04 Marks)
   c. Explain with sketch working of window Air conditioner.   (08 Marks)

* * * * *

2 of 2

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
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: h = 6.625× 10^{-34}JS, M_e = 9.1×10^{-31} kg, K = 1.38 × 10^{-23} J/K,
C = 3× 10^8 m/s, e = 1.602 × 10^{-19} C, N_A = 6.025 × 10^{+26}/k mol.

Module-1

1 a. Explain the energy distribution in the spectrum of a blackbody.   (05 Marks)
   b. Set up time independent Schrödinger wave equation in one dimension.   (07 Marks)
   c. A particle of mass 0.5 Me V/c^2 has kinetic energy 100eV. Find its de-Broglie wavelength.
                                                                                        (04 Marks)

OR

2 a. Define phase velocity and Group velocity. Show that group velocity is equal to particle
      velocity.   (06 Marks)
   b. State and explain Heisenberg's uncertainty principle.   (06 Marks)
   c. An electron is bound in one dimensional potential well of width 0.18nm. Find the energy
      value in eV of the second excited state.   (04 Marks)

Module-2

3 a. What is superconductivity? Explain superconductivity on the basis of BCS theory. (06 Marks)
   b. Explain the failures of classical free electron theory.   (06 Marks)
   c. Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi
      level at 400K in a material.   (04 Marks)

OR

4 a. What is Fermi factor? Discuss the probability of occupation of various energy states by
      electrons at T = 0°K and T > 0°K on the basis of Fermi factor.   (06 Marks)
   b. What is Meissner effect? Explain the working of maglev.   (06 Marks)
   c. The electron mobility and hole mobility of silicon are 0.17m^2/volt-sec and 0.035 m^2/volt-sec
      respectively at room temperature. If the carrier density is known to be 1.1×10^{16}/m^3, calculate
      the resistivity of silicon semiconductor material.   (04 Marks)

Module-3

5 a. Derive the expression for energy density of radiation in terms of Einstein's coefficients.
                                                                                        (06 Marks)
   b. With neat diagrams explain the different types of optical fibers.   (06 Marks)
   c. A medium in thermal equilibrium at temperature 300K has two energy levels with a
      wavelength separation of 1μm. Find the ratio of population densities of the upper and lower
      levels.   (04 Marks)

OR

6 a. What is Holography? With a neat diagram, explain the construction, reconstruction of
      Hologram.   (06 Marks)

b. What is numerical aperture? Obtain an expression for numerical aperture in terms of refractive indices of core and cladding. **(06 Marks)**

c. The attenuation of light in an optical fiber is 3.6dB/km, what fraction of its initial intensity remains after i) 1km   ii) 3km ? **(04 Marks)**

Module-4

7 a. What are Miller indices? Derive the expression for the interplanor spacing in terms of Miller indices. **(06 Marks)**

b. Describe the construction and working of Bragg's X-ray spectrometer. **(06 Marks)**

c. First order Bragg reflection occurs when a monochromatic beam of X-rays of wavelength $0.675A°$ is incident on a crystal at a glancing angle of $4°51'$. What is the glancing angle for third order Bragg reflection to occur? **(04 Marks)**

OR

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

b. Derive Bragg's law. **(05 Marks)**

c. Draw the crystal planes (100) (200) (001) and (011) in a cubic unit cell. **(04 Marks)**

Module-5

9 a. What is Mach number? Distinguish between acoustic, ultrasonic, subsonic and supersonic waves. **(05 Marks)**

b. What are nanomaterials? Explain the Sol – Gel method of synthesis of nano-materials. **(07 Marks)**

c. In a scanning electron microscope, electrons are accelerated by an anode potential difference of 60kV. Estimate the wavelength of the electron in the scanning beam. **(04 Marks)**

OR

10 a. What is a shock wave? Describe the construction and working of Reddy's shock tube. **(07 Marks)**

b. What is a carbon nano tube? Explain how it is synthesized using pyrolysis method. **(05 Marks)**

c. Mention the principle and three applications of SEM. **(04 Marks)**

* * * * *

14PHY12/22

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Physics

Time: 3 hrs.   Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing one full question from each module.*
2. *Physical constants :* $h = 6.63 \times 10^{-34} JS$; $m_e = 9.1 \times 10^{-31} kg$; $m_n = 1.675 \times 10^{-27} kg$, $C = 3 \times 10^8 m/s$; $N_A = 6.025 \times 10^{26} / k\ mole$; $K_B = 1.38 \times 10^{-23} JK$; $e = 1.6 \times 10^{-19} C$, $L_{ev} = 1.6 \times 10^{-19} C$.

Module-1

1 a. What is Plank's law? Show that how Plank's law reduces to Wein's law and Rayleigh – Jeans law under certain conditions. **(06 Marks)**
   b. Show that group velocity is equal to particle velocity. **(04 Marks)**
   c. State and explain Heisenberg's Uncertainty principle and show that electrons does not exist in nucleus. **(06 Marks)**
   d. An electron is bound in one dimensional potential well of width 0.18nm. Find the energy value in eV of the second excited state. **(04 Marks)**

2 a. What are Matter waves? Mention their characteristic properties. **(05 Marks)**
   b. Set up one dimensional time independent Schrodinger wave equation in case of a free particle. **(07 Marks)**
   c. What is Wave function? Mention important properties of wave function. **(04 Marks)**
   d. A particle of mass $0.5 Mev/C^2$ has kinetic energy 100eV. Find its de-Broglie wave length where 'C' is the velocity of light. **(04 Marks)**

Module-2

3 a. Discuss merits of quantum free Electron theory. **(06 Marks)**
   b. Explain Type – I and Type – II super conductors. **(04 Marks)**
   c. Write the expression for electron and hole concentrations in an intrinsic semiconductors and hence derive an expression for Fermi level in an intrinsic semi conductor. **(06 Marks)**
   d. Calculate the Fermi energy in eV for a metal at 0^0K if it has 5.86×10^{28} conduction electrons per cubic metre. **(04 Marks)**

4 a. What is Hall effect? Derive expression for Hall voltage in terms of Hall coefficient. **(07 Marks)**
   b. Define the terms Fermi level, Fermi factor and Fermi – Dirac statistics. **(04 Marks)**
   c. Explain Density of states. **(04 Marks)**
   d. Describe in brief BCS theory of super conductivity. **(05 Marks)**

Module-3

5 a. Derive an expression for energy density of radiation in terms of Einstein's coefficients. **(07 Marks)**
   b. Explain Propagation mechanism of light in an optical fiber and hence obtain expression for critical anlge. **(05 Marks)**
   c. Discuss Point – to – Point communication system using an optical fiber with block diagram. **(04 Marks)**
   d. The average output power of laser source emiting a laser beam of wavelength 633nm is 5mw. Find the number of Photons emitted per second by the laser source. **(04 Marks)**

6 a. Explain the construction and working of carbon dioxide laser with energy level diagram and illustrate modes of vibration of CO_2 molecules. (08 Marks)
   b. Define Acceptance angle and Numerical aperture and derive an expression for NA in terms of refractive indices of core and cladding. (06 Marks)
   c. Describe the recording of holographic image. (03 Marks)
   d. The angle of acceptance of an optical fiber is 30^0, when kept in air, what will be the angle of acceptance when the same is kept in a medium of Refractive index 1.33. (03 Marks)

Module-4

7 a. Explain in brief Seven Crystal Systems, with neat diagram. (07 Marks)
   b. Explain briefly the Principle and working of Liquid crystal display. (06 Marks)
   c. Calculate the atomic packing factor of BCC and FCC. (04 Marks)
   d. Derive Bragg's law. (03 Marks)

8 a. Describe how Bragg's X – ray spectrometer is used for determination of crystal structure. (07 Marks)
   b. What are Miller indices and explain the procedure to find Miller indices. (04 Marks)
   c. Explain the terms Polymorphism and Allotropy with examples. (04 Marks)
   d. X – rays of wavelength $0.82A^0$ undergo first order Bragg reflection from a crystal of cubic lattice with lattice constant $3A^0$ at a glancing angle of 7.855^0. Identify the Possible Planes which give rise to this reflection in terms of their Miller indices. (05 Marks)

Module-5

9 a. Explain the terms i) Mach number ii) Acoustic iii) Ultrasonic and iv) Shock wave. (04 Marks)
   b. Explain the construction and working of Reddy's shock tube. (06 Marks)
   c. What is Carbon nano tube? Discuss important properties and explain how it is synthesized using Pyrolysis method. (07 Marks)
   d. Mention three applications of SEM. (03 Marks)

10 a. Derive the Normal shock relationship using Rankine – Hugonit equations. (06 Marks)
   b. Explain the Principle , Construction and Working of Scanning Electron microscope. (07 Marks)
   c. Explain Synthesis of Nano materials using Ball Milling method. (04 Marks)
   d. Mention three Properties of Shock Waves. (03 Marks)

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐ **17ELE15**

First Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Electrical Engineering

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   State Ohm's law. Mention its limitations.   (05 Marks)
    b.   State and explain Kirchoff's laws as applied to D.C circuits.   (08 Marks)
    c.   A coil of 150 turns is linked with a flux of 0.01 weber when carrying a current of 10 A. Calculate the inductance of the coil. If the current is uniformly reversed in 0.01 sec, calculate the induced electromotive force.   (07 Marks)

OR

2   a.   Define dynamically induced e.m.f and statically induced e.m.f with examples.   (06 Marks)
    b.   Two resistors connected in parallel across 100V D.C supply. The total current from the supply source is 10 A. The power dissipated in one resistor is 600 W. What is the current drawn when they are connected in series across the same supply.   (08 Marks)
    c.   Define the co-efficient of coupling and find its relation with L_1, L_2 and M.   (06 Marks)

Module-2

3   a.   With a neat sketch, explain the construction of the various parts of a D.C generator.
                                                                       (08 Marks)
    b.   What is the significance of back EMF in a D.C motor?   (06 Marks)
    c.   With a neat figure, explain the construction and working principle of a dynamometer type wattmeter.   (06 Marks)

OR

4   a.   Derive the EMF equation of D.C generator.   (06 Marks)
    b.   Find the useful flux per pole of a 250V, 6 pole shunt motor (D.C) having a two circuit connected armature winding with 220 conductors. At normal working temperature, the overall armature resistance including brushes is 0.2 Ω. The armature current is 13.3 A at the no-load speed of 908 rpm.   (08 Marks)
    c.   Describe with a neat sketch, the constructional details and operation of a single phase induction type energy meter.   (06 Marks)

Module-3

5   a.   Derive an expression for power in pure capacitor circuit and draw voltage, current and power waveforms.   (07 Marks)
    b.   A series circuit with a resistor of 100 Ω, capacitor of 25 μF and inductance of 0.15 H is connected across 220 V, 50 Hz supply. Calculate impedance, current, power and power factor of the circuit.   (08 Marks)
    c.   With a neat sketch, explain 3-way control of Lamp.   (05 Marks)

OR

6 a. Define earthing. Explain any one type of earthing with a neat diagram.   (06 Marks)
   b. Two impedances $(150 - 157j)\Omega$ and $(100 + 110j)\Omega$ are connected in parallel across 200 V, 50 Hz supply. Find branch currents, total current and total power consumed in the circuit. Draw the phasor diagram.   (08 Marks)
   c. Define power factor and mention its practical importance.   (06 Marks)

Module-4

7 a. In a three phase star 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 6 pole, 3 phase, stars connected alternator has an armature with 90 slots and 12 conductors per slot. If revolves at 1000 rpm, the flux per pole being 0.5 web. Calculate the emf generated, if the winding factor is 0.97 and all the conductors in each phase are in series. The coil is full pitched.   (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 three phase load of three equal impedances connected in delta across a balanced 400 V supply takes a line current of 10 A, at a power factor of 0.7 lagging. Calculate
   (i) The phase current, (ii) Total power, (iii) The total reactive volt Ampers.   (07 Marks)

Module-5

9 a. Derive EMF equation of transformer.   (06 Marks)
   b. The maximum efficiency at full load and upf of a single phase 25 kVA, 500/1000 V, 50 Hz transformer is 98%. Determine the efficiency at (i) 75% load 0.9 p.f (ii) 50% load 0.8 p.f (iii) 25% load 0.6 p.f.   (07 Marks)
   c. A three phase 6 pole 50 Hz induction motor has a slip of 1% at No-load and 3% at full load. Determine (i) synchronous speed (ii) No-load speed (iii) Full load speed (iv) Frequency of rotor current at stand still (v) Frequency of rotor of rotor current at full load.   (07 Marks)

OR

10 a. Derive the condition for which the efficiency of a transformer is maximum.   (06 Marks)
    b. Define slip. Derive an expression for frequency of Rotor current.   (06 Marks)
    c. A single phase, 20 kVA transformer has 1000 primary turns and 2500 secondary turns. The net cross-sectional area of the core is 100 cm². When the primary winding is connected to 550 V, 50 Hz supply. Calculate (i) The maximum value of the flux density in the core (ii) the voltage induced in the secondary winding and (iii) The primary and secondary full load currents.   (08 Marks)

* * * * *

2 of 2

USN ☐☐☐☐☐☐☐☐☐☐   15ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 and explain Kirchhoff's law.   (05 Marks)
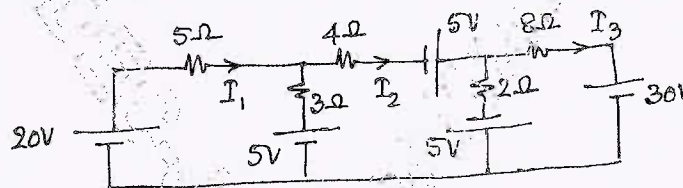   b. Refer Fig Q1(b). Find I_1, I_2 and I_3.   (07 Marks)

Fig. Q1(b)

   c. Coil A of 230 turns and coil B of 240 turns share a magnetic circuit of mean length 0.8m and uniform cross section area 115cm². Relative permeability of the core material is 1350. Find the self inductances of the coils. Find the average emf induced in coil A when, in coil B, the current changes from 2A to 6.5A in 0.03s. Assume k = 1.0 between the coils.
                                                                            (04 Marks)

OR

2 a. Define 'Self Inductance' of a coil. Derive an expression for the self inductance of a coil in terms of its geometry and material properties.   (05 Marks)
   b. Refer Fig Q2(b) find I_1, I_2 and the power in the 6Ω resistor.   (07 Marks)
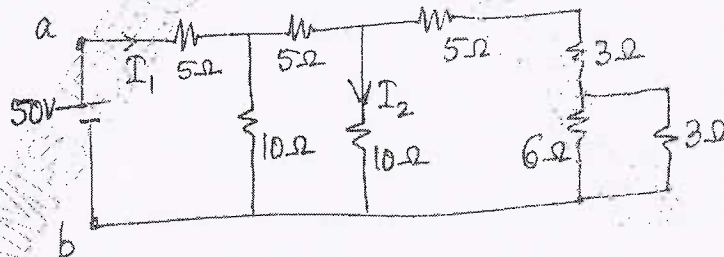
Fig. Q2(b)

   c. Coil A of 600 turns and coil B of 500 turns have k = 0.2. A current of 8A in coil A produces 40mWb flux in it. Find : i) Inductance of coil A with coil B open circuited ; ii) the flux linking coil B ; iii) the emf induced in coil B if the flux linking it falls to zero from its full value in 2ms ; and iv) mutual inductance between the coils.   (04 Marks)

Module-2

3 a. Deduce an expression for the armature torque, T_a, developed in a dc motor and hence show that $T_a \alpha \phi I_a$.   (02 Marks)
   b. A 100V short shunt dc generator supplies 200 lamps of 55W at 110V rating. $R_a = 0.06\Omega$; $R_{se} = 0.04\Omega$; and $R_{sh} = 25\Omega$. Sketch the circuit diagram and find the emf generated.
                                                                            (07 Marks)
   c. With a neat sketch, explain the working of a 1φ energy meter.   (07 Marks)

OR

4 a. "A dc series motor should never be run on light or no load". Justify. (03 Marks)

b. A shunt dc generator delivers 65kW at 250V and 500rpm. $R_a = 0.015\Omega$ and $R_{sh} = 85\Omega$. Find its speed when running as a motor taking 40kW from 240V supply. BCD = 1V/Brush. Sketch relevant circuit diagrams. (07 Marks)

c. With a neat schematic, describe the construction and working of a dynamometer type wattmeter. (06 Marks)

Module-3

5 a. Show that a pure inductor is lossless. (03 Marks)

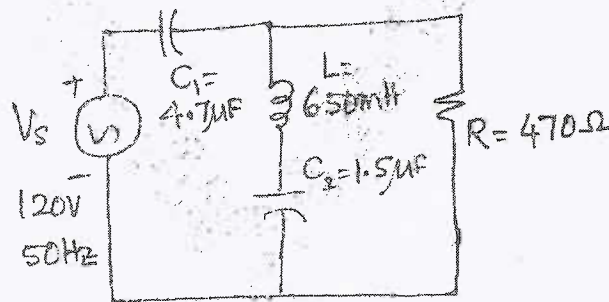b. Refer Fig. Q5 (b). Find the real power, reactive power and the apparent power supplied.

Fig. Q5(b) (06 Marks)

c. With a neat circuit diagram and truth table, explain the working of a 3-way control of a device. (07 Marks)

OR

6 a. Show that an R-C series circuit takes a leading current. Sketch a phasor diagram indicating the supply emf, the current and the two drops. (07 Marks)

b. A resonant series circuit with R = 5Ω, L = 1mH and C = 0.001μF is connected to a 100V supply. Find :
i) the drop across L ; and
ii) drop across C. Take the supply as the reference phasor. (05 Marks)

c. For a fuse, define i) Rated current, ii) Fusing current ; and iii) Fusing factor. Why is the fusing factor greater than unity? (04 Marks)

Module-4

7 a. Sketch a 4-wire STAR supply and identify the phase and line voltages. With balanced supply taking $E_R = E_P \underline{|0}$, obtain the relationship between the phase and line voltages. Hence, sketch a phasor diagram indicting all phase and line voltages. (08 Marks)

b. 2 wattmeters connected to measures 3ϕ power of a balanced Δ load read 2.5 kW and 0.5kW. Find the load pf if i) both readings are positive; and ii) the latter reading is obtained after reversing the connections of the potential coil. (04 Marks)

c. In a 3ϕ alternator, why is it advantageous to have the armature on the stator and the excitation on the rotor? (04 Marks)

OR

8 a. With a neat circuit diagram, show how 3ϕ power can be measured using two Wattmeters. State the NECESSARY CONDITION clearly. **(07 Marks)**

b. A balanced Δ load of (8+j6) Ω/phase is connected to a 400V supply. Find i) the phase current ii) the line current. If the same impedances are connected in STAR, what is the reactive power consumed and at what pf? **(04 Marks)**

c. A 4-pole, 3ϕ alternator driven at 1800rpm has 42 slots with 4 conductors/slot. Average flux/pole is 0.36 Wb, sinusoidally distributed. $K_p = 0.956$ and $K_d = 0.952$. Find the line voltage on no-load if connected in i) Δ ; and ii) STAR **(05 Marks)**

Module-5

9 a. Starting from expression for the efficiency of a transformer derive the condition for maximum efficiency and the expression for maximum efficiency. **(05 Marks)**

b. A 135 kVA, 1ϕ transformer has primary of 2kV, 50Hz. Primary and secondary number of turns are 162 and 48 respectively. Neglecting losses, find i) no-load secondary emf ; ii) full load primary and secondary currents; and iii) maximum core flux. **(04 Marks)**

c. With a neat sketch, explain the working of a STAR - Δ starter, for a 3ϕ induction motor. Show that the starting inrush current is reduced by 66.7%. **(07 Marks)**

OR

10 a. "A 3ϕ induction motor can never run at N_s". Justify. **(04 Marks)**

b. A single phase transformer has a maximum efficiency of 98% at 75% load, upf. The copper loss at maximum efficiency is 314W. Find its efficiency at 50% load, 0.9 pf. **(04 Marks)**

c. A 6-pole, 3ϕ alternator running at 1200rpm feeds a 4-pole, 3ϕ induction motor having slips of 3% at full load and 2.5% at half load. The rotor induced emf/phase at stand still is 160V. At full load and half load, find each of the following: i) the motor speed ; ii) frequency of the rotor induced emf and (iii) the rotor induced emf/phase. **(08 Marks)**

* * * * *

CBCS Scheme

First Semester B.E. Degree Examination, Dec.2017/Jan.2018
Elements of Mechanical Engineering

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1. a. Write the differences between Renewable and Non-Renewable energy resources. (06 Marks)
   b. Explain liquid flat plate collector with neat sketch. (06 Marks)
   c. Explain principle of Nuclear power plant with neat sketch. (08 Marks)

OR

2. a. Explain the formation of steam with T-H diagram. (08 Marks)
   b. Explain the construction and working of "Lancashire Boiler". (08 Marks)
   c. What are boiler mountings and accessories? List examples of each. (04 Marks)

Module-2

3. a. Explain the De Laval turbine with neat sketch and Pressure-Velocity diagram. (06 Marks)
   b. Explain the open cycle gas turbine with block diagram. (06 Marks)
   c. The following observations were made during a trial run on a four stroke diesel engine:
   Cylinder diameter = 25 cm
   Stroke of the piston = 40 cm
   Crank shaft speed = 250 rpm
   Brake load = 70 kg
   Brake drum diameter = 2 m
   Mean effective pressure = 6 Bar
   Diesel oil consumption = 0.1 litre/min
   Specific gravity of diesel = 0.78
   Calorific value of diesel = 43900 kJ/kg
   Find : (i) Brake power (ii) Indicated power (iii) Friction power (iv) Mechanical efficiency (v) Brake thermal efficiency (vi) Indicated thermal efficiency. (08 Marks)

OR

4. a. Explain construction and working of Four stroke SI engine with neat sketch and P-V diagram. (08 Marks)
   b. Explain the working of Pelton wheel with neat sketch. (08 Marks)
   c. Define : (i) Steam turbine (ii) Internal combustion engine. (04 Marks)

Module-3

5. a. Explain the taper turning by swivelling compound tool rest. (06 Marks)
   b. List the various operations performed on drilling machine. Explain with the neat sketches Boring and counterboring operations. (10 Marks)
   c. What is milling? Differentiate drilling and milling operation. (04 Marks)

OR

6 a. Define automation and explain the flexible automation.   (06 Marks)
    b. Define Robot and write the classification of robot based on physical configuration. Explain the Cartesian co-ordinate robot with neat sketch.   (08 Marks)
    c. With the block diagram, explain the basic elements of NC automation system.   (06 Marks)

Module-4

7 a. Write a note on ferrous alloys (any two).   (08 Marks)
    b. Define composite material. Mention its applications in aerospace and automation industries.   (06 Marks)
    c. Briefly explain types of non-ferrous alloys (any two).   (06 Marks)

OR

8 a. Explain with neat sketch the arc welding method.   (08 Marks)
    b. List the different types of Oxy-acetylene flames and state their applications.   (06 Marks)
    c. Define : welding, brazing and soldering.   (06 Marks)

Module-5

9 a. List out the desirable properties of an good refrigerant.   (06 Marks)
    b. Explain the principle and working of vapour compression refrigeration with neat sketch.   (08 Marks)
    c. Define the following : (i) Refrigeration (ii) Air conditioning (iii) Refrigerant   (06 Marks)

OR

10 a. Explain with a neat sketch, working of room air conditioner.   (08 Marks)
    b. What are the differences between vapour compression and absorption systems?   (08 Marks)
    c. List out refrigerants commonly used in practice.   (04 Marks)

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐

I / II Semester B.E. Degree Examination, Dec.2017/Jan.2018
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty 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 original Indian constitution had,
   a) 12 parts, 6 schedules and 309 Articles   b) 20 parts, 8 schedules and 395 Articles
   c) 22 parts, 5 schedules and 290 Articles   d) 22 parts, 8 schedules and 395 Articles

2. After the partition of India, the Indian constituent assembly was reconstituted with,
   a) 250 members   b) 275 members   c) 299 members   d) 305 members

3. Fundamental duties of Indian citizens are adopted from the constitution of,
   a) Russia   b) Germany   c) Ireland   d) U.S.A.

4. When was the drafting of the Indian constitution completed and adopted?
   a) 15th August, 1947   b) 26th January, 1950
   c) 26th November, 1949   d) 1st January, 1948

5. How many times the Preamble of the Indian Constitution has been amended?
   a) Once   b) Twice   c) Thrice   d) Not amended

6. Fundamental Rights are contained in,
   a) Part I   b) Part II   c) Part III   d) Part IV

7. Which one of the following guarantees all the fundamental rights to every resident of India?
   a) Right against exploitation   b) Right to freedom
   c) Right to equality   d) Right to constitutional remedies

8. Which fundamental right of the Indian Constitution has been deleted by the 44th Constitution Amendment Act?
   a) Right against exploitation   b) Right to property
   c) Right to protest   d) Right to freedom of press

-A1-

9. A writ of Mandamus can be issued by the supreme court to.
   a) An official to perform public duty   b) The company to raise wages
   c) The Prime Minister to dissolve the cabinet   d) None of these

10. How many types of writs can be issued by the Supreme Court and High Courts?
    a) Three   b) Four   c) Five   d) Six

11. The architects of Indian Constitution borrowed the concept of Directive Principles of state policy from the constitution of,
    a) U.S.A   b) U.K.   c) Ireland   d) Russia

12. Which of the following Articles contain directive principles of state policy?
    a) 30 to 49   b) 36 to 51   c) 42 to 56   d) 28 to 48

13. The term "Equal pay for equal work for both men and women" is a.
    a) Fundamental right   b) Statutory provisions in labour law
    c) Directive principles of state policy   d) None of these

14. The Directive principles of state policy,
    a) Cannot be enforced in any court
    b) Can be enforced in High courts only.
    c) Can be enforced in Supreme Court only
    d) Can be enforced in both Supreme Court and High Courts

15. This is not a Directive Principles of State Policy,
    a) Secure living wage   b) Provide free legal aid to poor
    c) Secure just and efficient judiciary   d) Organize village panchayats

16. Fundamental duties, 10 in number were included in the Indian constitution by,
    a) 42nd constitution Amendment Act   b) 44th Constitution Amendment Act.
    c) 40th constitution Amendment Act   d) 24th Constitution Amendment Act.

17. Which one among the following is not a fundamental duty?
    a) Abide by the constitution   b) Respect National Flag
    c) Abide by moral principles   d) Abjure violence

18. 12 members to Rajya Sabha are nominated by,
    a) Chairman of Rajya Sabha   b) President of India
    c) Prime Minister of India   d) Deputy Chairman of Rajya Sabha

19. How many members represent all the states in Lok Sabha?
    a) 510   b) 520   c) 530   d) 550

20. President of India addresses the joint session of both houses of the parliament in,
    a) First session (Budget)   b) Second session (Monsoon)
    c) Third session (Winter)   d) None of these

21. Who among the following appoints Chief Justice and other Judges of the Supreme Court of India?
    a) Prime Minister   b) Law Minister   c) President   d) Speaker of Lok Sabha

22. Prime Minister is appointed by.
    a) President   b) Chief Justice of India
    c) Lok Sabha speaker   d) Rajya Sabha chairman

-A2-

23. The chief minister of the state is appointed by the,
  a) Governor
  b) Chief Justice of India
  c) President of India
  d) Prime Minister of India

24. Who among the following issues ordinances during the recess of the state legislature?
  a) President of India
  b) Chief Minister
  c) Governor
  d) Chief justice of High court

25. Legislative council is created or abolished by,
  a) Legislative Assembly
  b) Parliament on the resolution of state Legislature
  c) Prime Minister
  d) Chief Minister

26. The salaries and allowances of the state council of Ministers are determined by the,
  a) Governor
  b) President of India
  c) Act of the state Legislature
  d) Prime Minister of India

27. The Chief Justice and other Judges of High Courts continue in office until they attain the age of,
  a) 60 years
  b) 62 years
  c) 58 years
  d) 65 years

28. The procedure for amending the Indian constitution is detailed under,
  a) Art.362
  b) Art.365
  c) Art.366
  d) Art.368

29. National Emergency proclamation under Article 352 is issued in case of,
  a) War
  b) External Aggression
  c) Armed rebellion
  d) All of these

30. Financial emergency under Article 360 is declared by,
  a) Prime minister
  b) Finance Minister
  c) President
  d) Chief Justice of India

31. Currently, there are how many members in the Election commission of India?
  a) 3
  b) 4
  c) 5
  d) 6

32. Election commission of India conducts elections to,
  a) Parliament
  b) State Legislatures
  c) Office of the President and Vice President
  d) All of these

33. In which of the following states is it constitutionally obligatory for the state to have a separate Minister for tribal welfare?
  a) Maharashtra
  b) Karnataka
  c) Madhya Pradesh
  d) West Bengal

34. At present, the number of seats reserved in Government service for other backward classes people (OBC) is,
  a) 20% seats
  b) 27% seats
  c) 30% seats
  d) 50% seats

35. National commission for women consists of,
  a) A Chairperson and 3 members
  b) A Chairperson and 4 members
  c) A Chairperson and 5 members
  d) A Chairperson and 6 members

36. Which Act for the first time gave an opportunity for Indians to enter into the sphere of Legislature?
  a) Government of India Act, 1858
  b) Indian Councils Act, 1861
  c) Indian Councils Act, 1892
  d) Indian Councils Act, 1909

-A3-

37. Who among the following are not entitled to form Union or Association?
    a) School Teachers   b) Workers   c) Entrepreneurs   d) Police Inspectors

38. Which among the following Directive Principles of state policy that has not been implemented so far?
    a) Uniform civil code   b) Separation of Judiciary from the executive
    c) Maternity relief to working women d) Protection of Historical monuments

39. The total number of Union Council of Ministers including Prime Minister shall not exceed _____ of the membership strength of Lok Sabha.
    a) 10%   b) 12%   c) 15%   d) 18%

40. The membership strength of various state legislative assemblies except Goa and Mizoram states is varying between.
    a) 40 to 450   b) 60 to 500   c) 50 to 500   d) 40 to 600

41. The professional ethics deals with _____ accepted by the professional group / community.
    a) Scientific standard   b) Moral standards   c) Ethical standards   d) None of these

42. Engineering Profession is considered to be like a building, its foundation is.
    a) Honesty   b) Hard and Sincere work
    c) Expert technical knowledge   d) Sound common sense

43. Which one among the following does not depict the attitude towards responsibility?
    a) Minimalist model   b) Maximalist model
    c) Reasonable care model   d) Good works model

44. _____ is not an impediment to responsibility.
    a) Ignorance   b) Fear   c) Self-deception   d) Self-respect

45. One of the ways of misusing the truth is.
    a) Failure to seek out the truth   b) Exaggerating the truth
    c) Making the confused statement   d) None of these

46. This is not dishonesty in science and engineering.
    a) Trimming   b) Cooking   c) Blending   d) Forging

47. Which of the following is not a trade secret?
    a) Formulae   b) Generated pattern   c) Equipment   d) Theorems

48. A compound measure of the probability and magnitude of adverse effect is known as.
    a) Benefit   b) Compensation   c) Risk   d) Both (a) and (b)

49. A fault tree is used to.
    a) Assess the risk involved   b) To claim compensation
    c) Take free consent   d) To improve safety

50. The author of a book retains the copy right for _____ years after his or her death.
    a) 20   b) 30   c) 50   d) 60

* * * * *

-A4-