D 94052 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

BASICS OF CIVIL ENGINEERING (CE 19101)

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain structural and construction engineering.
2. What is national building code.
3. List out the structural components of a residential building.
4. How can you classify buildings ?
5. List out the open space requirements for a building.
6. Define plot area, plinth area, floor area and carpet area.
7. Explain the method of reciprocal levelling. When do you need it ?
8. Distinguish between plans and maps.
9. What is Surveying ? State its objects.
10. List the properties of good bricks.
11. List various uses of cement.
12. What is meant by seasoning of timber ? Distinguish between natural and artificial seasoning.
13. Define safe bearing capacity of soil, and explain its importance in foundation design.
14. Distinguish between Flemish bond and English bond in brick masonry.
15. Explain the structural and functional features of bridges.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) Explain in detail the types of building as per NBC.

Or

(b) What are the steps involved in the selection of site for building ?

17. (a) Define orientation of a building. Explain the various aspects of orientation.

Or

(b) Explain in detail the principles of building planning.

18. (a) What are the temporary adjustments of dumpy level ? Explain how they are performed.

Or

(b) List various area of application of remote sensing.

19. (a) State the important properties and uses of cement mortar.

Or

(b) State the chemical and physical properties of Portland cement.

20. (a) Explain different types of bonds used in stone masonry with sketches.

Or

(b) Explain the functions and requirements of good foundations.

(5 × 10 = 50 marks)

D 94051 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

IT 19 100—INTRODUCTION TO COMPUTING AND PROBLEM SOLVING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What is a Microcomputer ? What is its function ?
2. What is an Algorithm ? How to validate algorithms ?
3. Give a short account of classification of computers.
4. What are the main characteristics of the memory cell ?
5. Define the term RAM. What is its role in a computer ?
6. Draw the block diagram of 64K byte memory.
7. What is Python ? Discuss its features.
8. What are the rules for local and global variables in Python ?
9. In Python no compilation and linking necessary. Explain.
10. Write a function space(x) that can be used to provide a space of x position between two output numbers.
11. Main is a user defined function. How does it differ from other user-defined function.
12. With suitable example explain mathematical function.
13. How does a class enforce data hiding, abstraction and encapsulation ?
14. Explain why classes are a great invention in the field of computer software.
15. What is the relationship of a class and its objects ?

(10 × 5 = 50 marks)

Turn over

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 marks.

16. (a) Explain in detail the different I/O units in a computer.

Or

(b) With suitable example explains how logical operations performed in a computer ?

17. (a) List and explain the major service provided by DOS.

Or

(b) Draw a block diagram of a memory which has 8 words of 4 bits each.

18. (a) Write a simple program in Python in which a value can be assigned to several variable simultaneously.

Or

(b) Write a program in Python to find the solution of simple harmonic oscillator equation.

19. (a) What is the function of increment / decrement operators ? How many varieties do they come in? How are these two varieties different from one another ?

Or

(b) How is call-by-value method of function invoking different from call-by-reference method ? Give suitable example.

20. (a) Write a program to search the name and address of person having age more than 30 in the data list of persons.

Or

(b) Write a program to read data from the keyboard, write it to a file called INPUT, again read the same data from the INPUT file, and display it on the screen.

(5 × 10 = 50 marks)

D 94050 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

CONCEPTS OF PRINTING TECHNOLOGY (PT 19 100)

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Discuss the features of various substrates used for writing before the invention of paper.
2. What are the features of planographic printing process ?
3. Write notes on trade shops.
4. Describe brochure, its types and steps involved in preparing it.
5. Explain various types of proof.
6. Compare traditional publishing and self-publishing.
7. What are the advantages of computer networking in printing ?
8. Write notes on application software.
9. Describe web browser and URL.
10. Compare raster and vector images.
11. Write notes on resolution.
12. What is the relationship between light and color ? Explain.
13. Describe RGB and CMYK. Explain its significance in printing.
14. What is the principle of offset printing ? What are its applications ?
15. Compare warm and cool colors.

(10 × 5 = 50 marks)

Part B

Answer **one** *full question from each section.*
Each question carries 10 *marks.*

16. a) Compare printing processes with and without master.

Or

b) Explain the role of finishing processes in printing.

17. a) Discuss different types of publishing.

Or

b) Explain different types of print media.

18. a) Discuss the advantages and types of digital printing.

Or

b) Describe operating system, its features and types.

19. a) Discuss various types of originals for printing.

Or

b) Explain the process of color printing.

20. a) i) Explain the offset cylinder configuration with a neat diagram. (5 marks)

ii) Explain the process of printing colors. (5 marks)

Or

b) i) Discuss the 4 units of an offset press with the help of a diagram. (5 marks)

ii) Write notes on color attributes. (5 marks)

[5 × 10 = 50 marks)]

D 94049 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

ME 19 101—BASICS OF MECHANICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What is meant by ideal cycle or air standard cycle ? What is its use ?
2. Draw the p-V and T-S diagram for diesel cycle.
3. 'Carnot cycle engine cannot be realized in practice'. Justify the statement.
4. Describe the various parts of IC engine.
5. Explain the creep and slip in belt drive.
6. What are the different types of brakes and its application ?
7. What is meant by eco-friendly refrigerant ? Why do we need it ?
8. What is the function of volute casing in centrifugal pump ?
9. Why priming is required in pump ?
10. What is geo thermal energy ?
11. What is a chain reaction ?
12. List out the advantages and disadvantages of thermal power plant ?
13. What are the various applications of alloy steel ?
14. List out the merits and demerits of CNC machines over conventional machines.
15. Distinguish between direct and indirect extrusion.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) 5 m^3 of gas at 8 bar and 180°C is heated keeping the pressure same throughout till the volume is doubled. Find the heat added, external work done and the change in internal energy during the process. Take c_p = 1.005 kJ/kg.K, c_v = 0.718 kJ/kg.K.

Or

(b) 0.5 kg of air is compressed reversibly and adiabatically from 80 kPa, 60° C to 0.4 MPa, and is then expanded at constant pressure to the original volume. Calculate the heat transfer and work transfer for the whole path. Take R = 0.287 kJ/kg.K, c_p= 1.005 kJ/kg.K and c_v = 0.718 kJ/kg.K

17. (a) Compare SI engines with CI engines.

Or

(b) With the help of neat sketch explain the working of single plate clutch.

18. (a) Explain the working principle of reciprocating pump.

Or

(b) What are the important properties that are required for an ideal refrigerant ?

19. (a) Explain the working principle of Hydel power plant with the help of neat sketch.

Or

(b) Explain the various types of non renewable energy sources.

20. (a) Describe the various milling operations.

Or

(b) What are the various operations that can be performed on a shaper machine ? Explain any *four* of them.

(5 × 10 = 50 marks)

D 94048 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

ME 19 100—CONCEPTS OF MECHANICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Draw the p-V and T-S diagram for Otto cycle.
2. What do you mean by reversible cycle ? Give example.
3. The entropy of the universe tends to be maximum. Comment.
4. Differentiate between 2 stroke and 4 stroke engine.
5. What way CRDI different from conventional solid injection system ? What are the advantages of CRDI ?
6. What are the advantages of gear drive over other drives ?
7. What is the function of Draft tube in reaction turbine ?
8. Define COP. Explain the function of refrigerants in refrigeration.
9. Differentiate between hydraulic turbine and pump.
10. What is the function of moderator in nuclear power plant ?
11. What are the applications of solar energy ?
12. What are advantages and disadvantages of nuclear power plant ?
13. What are the various mechanical properties of engineering materials ?
14. Explain counter boring and counter sinking operations in drilling.
15. What are the main elements ofNC machine ? What is the additional feature in CNC ?

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) 5 m^3 of gas at 8 bar and 180°C is heated keeping the pressure same throughout till the volume is doubled. Find the heat added, external work done and the change in internal energy during the process. Take c_p = 1.005 kJ/kg.K, c_v = 0.718 kJ/kg.K.

Or

(b) A constant volume chamber of 0.3m^3 capacity contains 2 kg of a gas at 5° C. Heat is transferred to the gas until the temperature is 100° C. Find the work done, heat transferred, and the change in internal energy, enthalpy and the entropy. Take c_p = 1.968 kJ/kg.K and c_v = 1.507 kJ/kg.K.

17. (a) With help of neat sketch explain 4 stroke diesel engine.

Or

(b) What is meant by gear train ? Explain different types of gear train.

18. (a) Explain the working principle of reciprocating pump.

Or

(b) What is the principle of working of vapour absorption refrigeration system ?

19. (a) Explain the working principle of Thermal power plant with the help of neat sketch.

Or

(b) Explain the various types of non-renewable energy sources.

20. (a) What are the various forging operations ? Explain briefly each of them.

Or

(b) What are the various operations that can be performed in a drilling machine ? Explain any *four* of them.

(5 × 10 = 50 marks)

D 94047 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

EE 19 101—BASICS OF ELECTRICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. With suitable example explain mesh analysis.
2. A resistor of 5Ω is connected in series with a parallel combination of 6Ω and 3Ω. Find the supply current taken from a 35 V dc source.
3. A 40 W, 100 V lamp is connected to a 230 V. Calculate the value of resistance required to connect the bulb in series to safety of the bulb.
4. A circuit has inductance 1/π Henry and resistance 200Ω. A supply of 50 cycles per second A.C is applied to it. Calculate the reactance and impedance offered by the circuit.
5. With suitable example illustrate the phenomenon of electromagnetic induction.
6. Discuss the application of magnetic circuits.
7. Explain three phase power measurement using two wattmeter.
8. Give the significance of phase representation of alternating quantities.
9. What do you meant by Q factor of LCR circuit ? Explain.
10. Briefly explain the constructional details of dc machine.
11. Give the principle of operation of a single phase transformer.
12. A transformer has 100 turns of wire on its primary winding and 20 turns of wire on its secondary winding. If the supply voltage is 200 V, calculate the secondary voltage.
13. Distinguish between squirrel cage and slip ring induction motor.
14. Draw a labeled block diagram of solar power plant.
15. What are the advantages of tidal power system ?

(10 × 5 = 50 marks)

Turn over

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) State and explain Kirchoff's laws. Illustrate its significance by choosing any network circuit. Find the balancing condition of wheat stones bridge using the above law.

Or

(b) Explain with suitable example the methods formation of network equations by mesh current and node voltage.

17. (a) List the similarities and dissimilarities between magnetic and electric circuits.

Or

(b) The magnetic flux density inside a toroid having 3200 turns with inner and outer radii 10 cm and 11 cm is 2.5 T. for a current of 0.8 A. Calculate the relative permeability of the core.

18. (a) A series LCR circuit containing a resistance of 8 ohm an inductance of 0.2 H and a capacitor of 100 micro farad are connected in series across a 100 V 50 Hz supply. Calculate the total circuit impedance, current, power factor.Also draw the voltage phasor diagram.

Or

(b) Three impedance each of resistance 15 Ω and inductive reactance 10 Ω are connected in delta across a balanced 3ϕ, 400 V a.c supply. Determine the line current, phase current, power factor and active power drawn from the mains.

19. (a) Explain in detail with a neat circuit diagram the construction of single phase and three phase transformer.

Or

(b) A d.c. shunt generator has a terminal voltage of 220 V, field current of 0.5 A and load current of 12 A. Find the induced voltage in the armature resistance 0.2 Ω.

20. (a) Explain the various advantages and disadvantages of three phase induction motors.

Or

(b) With a neat block diagram explain the working of nuclear power plants.

(5 × 10 = 50 marks)

D 94046 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

EE 19 100—CONCEPTS OF ELECTRICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Discuss the steps to solve circuits by Kirchhoff's law.
2. State and prove Maximum power transfer theorem.
3. Explain star delta transformation with suitable example.
4. With a diagram explain the generation of sinusoidal emf.
5. Distinguish between rms value and average value of an AC.
6. For a 230 V, 50 Hz sin wave, find out the instantaneous voltage at 1 millisecond after the positive maximum value.
7. Define form factor of an ac. Obtain is its value ?
8. The current in a circuit is given by I = 100 sin 728 t. Find the maximum value and frequency of the current.
9. With suitable example explain phasor diagram of single phase a.c. circuit.
10. Why is the self induced emf stronger when the current in a circuit is cut off than when it is started ?
11. Define Faradays laws of electromagnetic induction.
12. Distinguish between dynamically induced emf and statically induced e.m.f.
13. A series circuit has resistance of 75 Ω and an impedance of 150 Ω. What power is consumed in the circuit when an effective voltage of 120 volts is applied to it ?
14. Explain the concept of time constant.
15. Give a short note on dielectric capacitors.

(10 × 5 = 50 marks)

Turn over

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) What are the difference between network, loop and mesh. Discuss the nodal method for solving complicated network. Explain with suitable example.

Or

(b) (i) What are the main difference between Thevenins and Nortons equivalent circuit ?

(ii) Calculate the open circuit voltage and Thevenin resistance of a simple two terminal network. In it two resistors 20 Ω and 30 Ω and a source of 100 volts are connected in series and the terminals are the ends of a 30 Ω.

17. (a) Explain the concept of phase and phase difference. Briefly explain rectangular and polar representation of phasors. Derive an expression for RMS value of alternating sinusoidal current.

Or

(b) With necessary theory explain in detail the circuit, waveform and vector diagram of ac through pure resistive and inductive circuit.

18. (a) With necessary theory analyses an ac circuit with R L C connected in series.

Or

(b) A 230 V, 50 Hz voltage is applied to a coil of L = 5 H and R = 2 Ω in series with a capacitance. What value must C have in order that the p.d. across the coil shall be 250 V.

19. (a) Compare electric current flow and magnetic flux flow. Define flux, flux density reluctance and permeability with respect to magnetism.

Or

(b) Define self induction and mutual induction. Derive the expression forboth.

20. (a) An ideal single phase transformer has 500 turns on the primary winding, and 100 turns on the secondary winding. If the supply voltage is 1000 V, find the turns ratio and the secondary voltage. If the secondary load is a no inductive resistor of 10 Ω resistance, calculate (i) Current through the secondary windings ; (ii) Current through the primary windings ; (iii) Power drawn by the load.

Or

(b) A constant e.m.f. is applied to a circuit containing capacitance and resistance in series. Obtain an expression for the charge on capacitor plates and current during charging. What do you mean by time constant of the circuit ?

(5 × 10 = 50 marks)

D 94045 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

EC 19 101—BASICS OF ELECTRONICS ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Compare the electrical behavior of Inductors and Capacitors.
2. Briefly explain the construction of mica and ceramic capacitors.
3. Discuss the principle and working of relays and contactors.
4. Discuss the importance of material used for the construction of solar cell.
5. Define the term diode froward recovery time and diode reverse recovery time.
6. Draw the energy band diagram for an open circuited pn junction. Explain in detail.
7. Explain the role of filter in a power supply.
8. With help of waveform, explain the working of half wave rectifier.
9. Draw the block diagram of a d.c. power supply.
10. A 10 V zener diode along with a series resistance is connected across a 40 V supply. Calculate the minimum value of resistance required if the maximum zener current is 50 mA.
11. In a phase shift oscillator, the three RC networks are identical with R = 200 kΩ and C = 100 pF. Find the frequency of oscillation.
12. Define current gain, voltage gain, and power gain of a CE amplifier.
13. Draw the block diagram of AM transmitter.
14. Explain the principle of AM demodulation with a neat circuit diagram.
15. Discuss the advantages of optical communication.

(10 × 5 = 50 marks)

Turn over

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) Briefly explain how inductors are classified.

Or

(b) Explain the construction and use of different types of capacitors.

17. (a) Explain with a neat sketch the principle and operation of Photo diode. What are its advantages ? Mention its applications.

Or

(b) Explain the principle and operation of LED.

18. (a) Explain AND and OR gates. How NAND gate can be used to realize OR operation ?

Or

(b) Draw the circuit of a full wave rectifier and explain its working.

19. (a) Elaborate in detail with circuit diagram the principle and working of a phase shift oscillator.

Or

(b) List and explain the properties of ideal operational amplifier. Discuss the importance of inverting and non-inverting amplifier.

20. (a) With help of block diagram explain FM radio receiver.

Or

(b) Draw the block diagram of optical communication. With a neat sketch explain light transmission through fiber.

(5 × 10 = 50 marks)

D 94044 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

EC 19 100—CONCEPTS OF ELECTRONIC ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Briefly explain the construction and advantages of metal film resistors.
2. List the different type of capacitors and explain its identification using colour code.
3. What do you meant by electro mechanical components ? Explain with examples.
4. Distinguish between intrinsic and extrinsic semiconductors.
5. Explain specification parameters of diodes and numbering.
6. Explain the construction of solar cell and give the importance of the material used for it.
7. Give the structure and doping of BJT.
8. Explain the concept of load line and operating point.
9. What is the significance of frequency response of an amplifier ?
10. Mention few advantages of FET over BJT.
11. What are the important features of MOSFET ?
12. Draw the electrical equivalent of a UJT and give its principle operation.
13. Discuss the generalized performance parameters of instruments.
14. What is function generator ? Give its principle and applications.
15. Distinguish between analog and digital multimeter.

(10 × 5= 50 marks)

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) With necessary diagram, explain the construction, working, rating and applications of ceramic capacitors.

Or

(b) Give the concept of fixed and variable resistors. Explain the construction of single layer, multilayer and variable inductors.

17. (a) Discuss in detail the formation of barrier potential and derive the diode current equation of a PN junction diode. Explain voltage multiplier circuits.

Or

(b) (i) Explain the working of a positive clipper and biased clipper.

(ii) What is a clamping circuit ? Explain the working of a positive clamper.

18. (a) Explain in detail an experiment to study the input and output characteristics of common base configuration of transistor.

Or

(b) Write an essay on various methods of biasing a transistor.

19. (a) What do you mean by depletion-type MOSFET. Explain the structure, principle of operation and application of enhancement type MOSFET.

Or

(b) What is SCR ? What do you mean by holding current of an SCR ? Explain the action of gate on the triggering of an SCR.

20. (a) Draw the labeled block diagram of CRO. Explain its structure. How CRO is used to measure voltage, frequency and phase.

Or

(b) Draw the labeled block diagram of DSO and give its advantage over CRO.

(5 × 10 = 50 marks)

D 94043 (Pages : 6) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.TECH.

EM 19 100—ENGINEERING MECHANICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. State parallelogram law of forces with relevant diagram.
2. State Lami's theorem.
3. A force of 500 N forms angles 60°, 45° and 120° respectively with x, y and z axis. Find the components F_x, F_y and F_z and express them in vector forms.
4. State the laws of dry friction. What is the co-efficient of static friction ?
5. Differentiate static friction and Kinematic friction.
6. A wooden block rest on a horizontal plane as shown in the Figure 1. If the co-efficient of limiting and dynamic friction between the block, and the horizontal plane are 0.3 and 0.24 respectively, determine the force required to impend the block right side

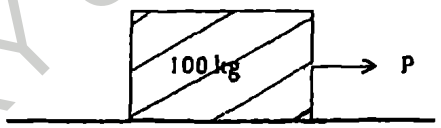


Figure 1

7. What is polar moment of inertia and area moment of inertia?
8. Derive the expression for the centroid of a semicircle
9. Determine the centroid of the rectangle lamina 55 mm. × 25 mm.

10. The motion of a particle moving in a straight with variable acceleration is given by, $s = 15t + 3t^2 - t^3$ in which, 's' is the distance measured in meter and the time 't' is measured in seconds. Calculate the velocity and acceleration at the start and the time, at which the particle attains its maximum velocity.

11. Define D' Alembert's principle and its applications.

12. A 40 kg. block is lying on an inclined rough plane as shown in figure 2. It is pulled by 600 N force by means of a rope parallel to inclined plane. If the initial velocity of the 40 kg. block is 2.4 m/sec then determine the final velocity of the block after traversing 5 m. on inclined plane by using D' Alembert's principle :

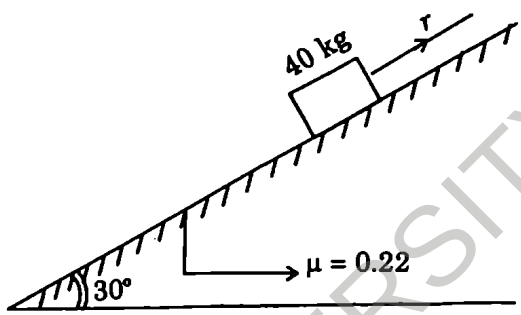


Figure 2

13. State the two main characteristics of simple harmonic motion.

14. Explain the types of natural vibrations with sketches.

15. A rigid body is acted upon by a force of 100 N, the velocity of the body changes from 15 m/s to 25 m/s during a period of 50 s. Find the mass of the body and the distance moved by the body during the time of interval.

(10 × 5 = 50 marks)

Part B

Answer **one** *full question from each Section.*

Each question carries 10 *marks.*

I. (a) A wheel has five equally spaced radial spokes. If the three consecutive spokes are in tension 800 N, 500 N and 300 N respectively, find the tensions in other two spokes.

Or

(b) Two identical spheres of weight 1000 N are held in equilibrium on inclined plane and against wall as shown in Figure 3. Draw a free body diagram and determine the reactions at A, B, C and D.

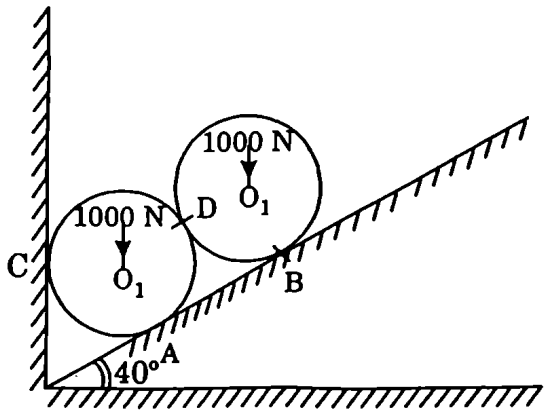


Figure. 3

II. (a) A uniform ladder of length 10 m. and weighing 250 N is placed against a smooth vertical wall with its lower end 5m from the wall. The co-efficient of friction between the ladder and floor is 0.3. Show that the ladder will remain in equilibrium in this position. What is the frictional force acting on the ladder at the point of contact between the ladder and the floor ?

Or

(b) A truss is shown in Figure 4. Find the forces in all members of the truss and indicate, whether it is in tension or compression.

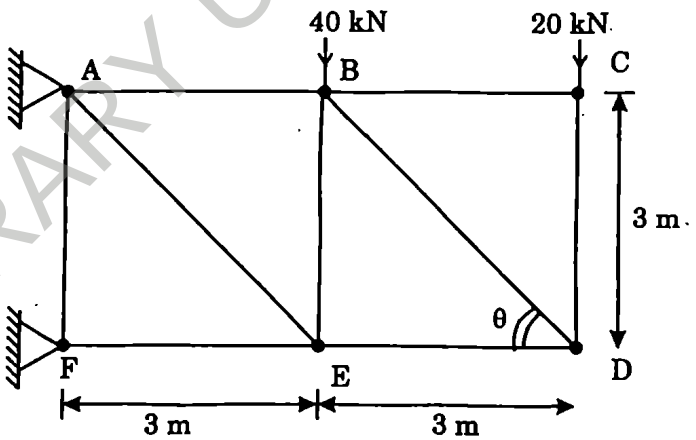


Figure 4.

III. (a) A thin homogeneous wire is bent into a triangular shape ABC such that AB = 240 mm, BC = 260 mm and AC = 100. Locate the C.G. of the wire with respect to the co-ordinate axes. Angle at A is right angle as shown in Figure.5.

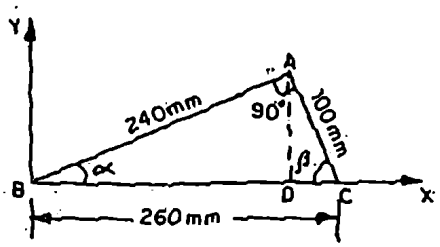


Figure 5

Or

(b) Find the centroid of Figure 6 :

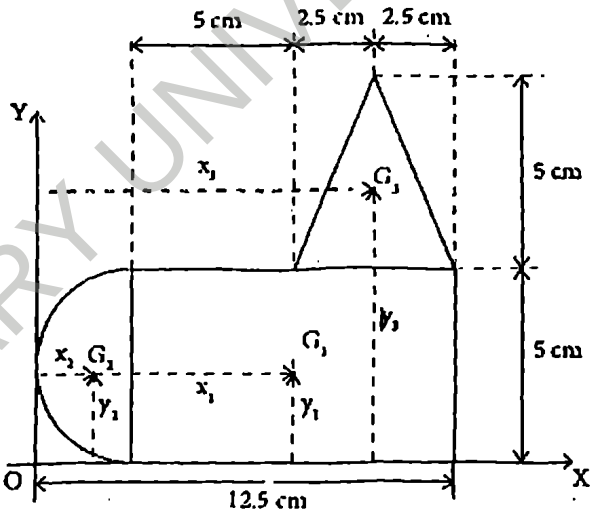


Figure 6

IV. (a) Two blocks 40 kg. and 24 kg. are connected by inextensible string and supported as shown in Figure 7. Determine tension in string and acceleration of each block. The co-efficient of friction between block and horizontal plane is 0.25. Consider pulleys as frictionless and weightless.

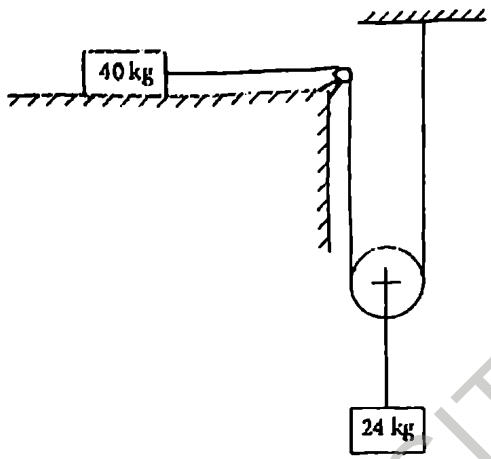


Figure. 7

Or

(b) The lengths of connecting rod (BC) and crank (AB) in a reciprocating pump are 1125 mm. and 250 mm, respectively. The crank is rotating at 420 r.p.m. Find the velocity with which the piston will move, when the crank has turned through an angle of 40° from the inner dead centre as shown in figure 8. Also find the angular velocity of the connecting rod.

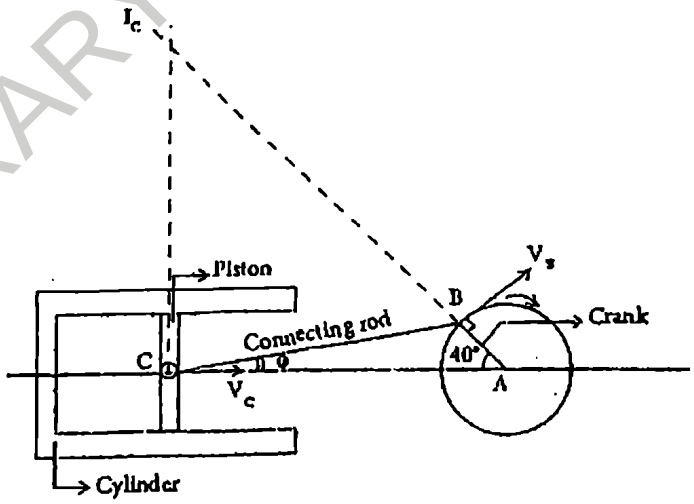


Figure 8

Turn over

V. (a) A 3000 N block starting from rest as shown in Figure 9 slides down a 50° incline. After moving 2 m, it strikes a spring whose stiffness is 20 N/mm. If the co-efficient of friction between the block and the incline is 0.2, determine the maximum deformation of the spring and the maximum velocity of the block.

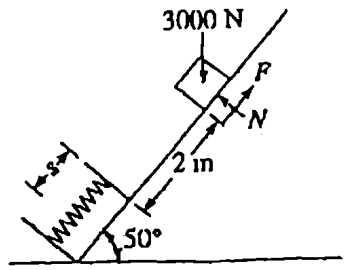


Figure 9

Or

(b) A rod of length L and M is pivoted at one end to constitute a pendulum as shown in figure 10. Determine its period of oscillation and calculate its length if the period is desired to be 1 second. If the rod was suspended from a point at one-quarter of its length. What would be the expression for the period and what would be the length of the rod required for a period of 1 second ?

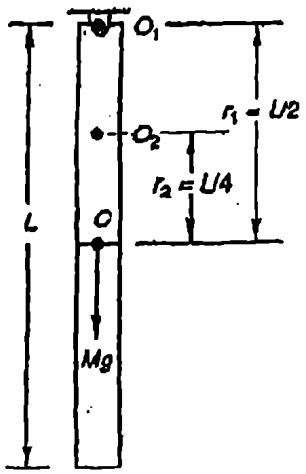


Figure 10

(5 × 10 = 50 marks)

D 94042 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

GS 19 100—ENGINEERING GRAPHICS

Time : Three Hours Maximum : 100 Marks

Answer **three** *questions from Part A and any* **two** *questions from Part B.*
All question carry equal marks.

Part A

1. (a) The line AB measuring 60 mm has its VT 15 mm above HP. The end B is 30 mm above HP and 35 mm in front of VP. The projectors through B and VT are 80 mm apart. Draw the projection of the line if the end Q is in second quadrant.

Or

(b) A rectangular plate of size 70 mm × 40 mm rests on its shorter side in the V.P and the surface is inclined at 45° with the V.P. The longer side of the plane is inclined at 30° to the H.P. Draw its projection.

2. (a) Draw the projection of a cube having 40 mm long sides and resting on the ground on one of its comers with a solid diagonal perpendicular to the V.P.

Or

(b) A pentagonal prism having a base with a 40 mm side and 70 mm height is kept on its base on HP with a rectangular face perpendicular to VP. It is cut by an A.I.P such that the true shape of the section is an isosceles triangle of largest base and a 60 mm altitude. Draw the sectional top view and true shape of the section.

3. (a) In a cylindrical drum, with a 60 mm diameter and a 100 mm height is resting on its base on the HP. A square hole with an 50 mm side is cut through the drum such that one of the faces of the square hole is makes 30° with the HP. The axis of the square hole is perpendicular to the VP and is 12 mm away from the axis of the cylinder. Draw the development of the retained cylinder.

Or

(b) A hexagonal prism, having a base with a 25 mm side and 100 mm long axis, is placed centrally on its rectangular face over a cylindrical block of with an 80 mm base diameter and 30 mm thickness. Draw isometric projection of the arrangement.

(3 × 20 = 60 marks)

Turn over

Part B

Answer any **two** *questions.*

4. (a) A square prism having a base with a 40 mm side and 60mm long axis is resting on its rectangular face on the G.P with axis inclined at 30°to PP. A side of base nearer to the PP is 20 mm behind it and 20 mm to the left of the station point. The station point is 80 mm in front of PP and 70 mm above GP. Draw its perspective view.

   (b) Draw neat sketch of Rag foundation bolt having a diameter of 30 mm.

   (c) A square pyramid side of base 50 mm and axis height 70 mm is kept with its base on H.P It is cut by a section plane perpendicular to VP which contains one of the base comers and is perpendicular to the slant edge opposite to this base comer. Draw the sectional plan, elevation and true shape of the section.

(2 × 20 = 40 marks)

D 94041 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2020

CH 19 100—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Describe the principle involved in the determination of hardness of EDTA method.
2. The hardness of 1000 litres of a water sample was completely removed by a zeolite softener. The zeolite had required 30 litres of NaCl solution containing 1500 mg/L of NaCl for regeneration. Calculate the hardness of water sample.
3. Discuss the properties and applications of polyacetylene.
4. Write a note on condensation polymerization.
5. Define flash and fire point, cloud and pour point of a lubricant.
6. Distinguish between Octane number and Cetane number.
7. The ultimate analysis of coal gives carbon = 84 %, Sulphur = 1.5 %, Nitrogen = 0.6 %, Hydrogen = 5.5 % and Oxygen = 8.4 %. Calculate the gross and net calorific values using Dulong's formula.
8. Derive Nernst equation and write its applications.
9. Explain the construction and working of solar cell.
10. Write a note on dry corrosion.
11. How corrosion is controlled by cathodic protection method ?
12. Explain the process of electroplating.
13. What are the various constituents of paints ? Explain the function of each with suitable examples.
14. Write a note on fullereness.
15. List the importance and limitations of green chemistry.

(10 × 5 = 50 marks)

Turn over

Part B

Answer section (a) **or** *section (b) of each question.*

Each question carries 10 *marks.*

16. (a) Narrate the treatment of water for domestic use.

Or

(b) What is glass transition temperature (Tg) ? Discuss the factors affecting Tg.

17. (a) Explain the mechanism of lubrication with suitable example.

Or

(b) What is cracking of petroleum ? Explain catalytic cracking of petroleum with necessary diagram.

18. (a) Construct standard hydrogen electrode and state its applications.

Or

(b) Explain the construction and working of lead-acid accumulator.

19. (a) List the significance of galvanic series and describe the mechanism of galvanic corrosion.

Or

(b) Give a detailed account of the process of anodizing aluminium.

20. (a) Write a note on synthesis of CNTs by CVD process and discuss its properties and applications.

Or

(b) List the twelve key principles of green Chemistry.

(5 × 10 = 50 marks)

D 94040 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

PH 19 100—ENGINEERING PHYSICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. With necessary theory discuss the effect on the diameter of a ring if air is replaced by a liquid in Newton's rings arrangement.
2. What is resolving power of an optical instrument ? Obtain the equation.
3. What is grating element ? Write down the grating equation in terms of grating element.
4. Estimate the de-Broglie wavelength of an oxygen molecule in air at room temperature.
5. Uncertainty in time of a excited atom is about 10^{-8} s. Calculate the uncertainties in energy and in frequency of the radiation.
6. What are operators in Quantum Mechanics ? Explain any *one* of them with its application in physics.
7. State and explain the laws of transverse vibrations of a stretched string.
8. Discuss the factors affecting acoustics of a building.
9. An ultrasonic interferometer is used to measure the velocity in sea-water. If the distance between two consecutive antinodes is 0.5 mm, compute the velocity of the waves in the sea-water. The frequency of the crystal is 1.5 MHz.
10. List the various fibre optic sensors. Explain any *one* of them.
11. A fibre cable has an acceptance angle of 30° and a core of refraction of 1.4. Calculate the refractive index of the cladding.
12. Distinguish between Step index fibre and Graded index fibre.
13. Discuss Einstein's co-efficients and its significance.

Turn over

14. What is SQUID ? Give its applications.

15. Briefly explain Type 1 and Type 2 superconductors.

(10 × 5 = 50 marks)

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) Whatis an air wedge ? Describe the method of finding the thickness of a thin wire using the air wedge arrangement. Derive the formula used.

Or

(b) Explain in detail the construction and working of Nicol prism. How it can be used as a polarizer or as an analyzer.

17. (a) Discuss one dimensional infinite square well potential with necessary theory.

Or

(b) Explain the following :

(i) Phase space.

(ii) Macrostates and Microstates.

18. (a) (i) Equation of a transverse wave travelling along a string is $y = 4 \sin\pi (0.010 \times - 2.0t)$. Where x and y are in centimeter and t is in second. Find (i) Amplitude ; (ii) Wavelength ; (iii) Initial phase at the origin ; and (iv) Frequency of the wave.

(ii) List the characteristics of wave motion.

Or

(b) Explain piezoelectric effect. Describe the piezoelectric method of producing ultrasonic waves.

19. (a) Explain the construction and working of solar cells. Discuss its V-I characteristics.

Or

(b) Explain the following :

(i) With block diagram explain optical fibre communication system.

(ii) List the industrial application of optical fibre.

20. (a) (i) Explain the role of optical resonator in laser.

(ii) Outline the principle and working of He-Ne laser.

Or

(b) (i) What is Meissner effect ?

(ii) What are the applications of superconductors ?

(5 × 10 = 50 marks)

D 94039 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2020

B.Tech.

MA 19 100—CALCULUS AND LINEAR ALGEBRA

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Evaluate $\lim_{x \to \pi/2} (\sin x)^{\sec x}$.

2. Test the convergence of the following series :

   (i) $\sum_{k=1}^{\infty} \left(\frac{3k^3 - 2k^2 + 4}{k^7 - k^3 + 2} \right)$; and (ii) $\sum_{k=1}^{\infty} \left(\frac{3k+2}{2k-1} \right)^k$.

3. Test the convergence of the series $\sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{k^{4/3}}$. Is the series absolutely convergent.

4. Expand $\cos\left(\frac{\pi}{4} + x\right)$ in powers of $x - \pi/4$.

5. Expand $\log(\cos x)$ as Maclaurin's series.

6. Find the n^{th} derivative of $e^{3x} \sin^2 x$.

7. If $u = \log\left(\frac{x^3 + y^3}{x + y}\right)$. Show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2$.

8. Locate all relative extrema and saddle points of $f(x, y) = 3x^2 - 2xy + y^2 - 8y$.

Turn over

9. Find the radius of curvature at $(3,3)$ on the curve $x^3 + y^3(x-6) = 0$.

10. Find the rank of the matrix $A = \begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & -2 & 1 \\ 1 & -1 & 4 & 0 \\ -2 & 2 & 8 & 0 \end{bmatrix}$.

11. Test for consistency and solve $5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5$.

12. Given $A = \begin{bmatrix} 2 & 1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ find A^{-1} using Cayley-Hamilton theorem.

13. Find the Fourier series expansion of $f(x) = x$ in $-\pi \le x \le \pi$.

14. Find the half-range sine series expansion of $f(x) = x^2$ in $0 < x < 3$.

15. Find the half-range cosine series expansion of $f(x) = \sin x$ in $0 \le x \le \pi$.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*
Each question carries 10 *marks.*

16. (a) Discuss the convergence of the series :

$$\frac{x}{1\cdot 2} + \frac{x^2}{3\cdot 4} + \frac{x^3}{5\cdot 6} + \frac{x^4}{7\cdot 8} + \ldots.$$

Or

(b) Discuss the convergence of the series :

$$1 + \frac{x}{2} + \frac{2!}{3^2}x^2 + \frac{3!}{4^3}x^3 + \frac{4!}{5^4}x^4 + \ldots. \infty \ (x > 0).$$

17. (a) Prove that $e^x \cos x = 1 + x - \frac{2}{3!}x^3 - \frac{2^2}{4!}x^4 - \ldots\ldots$

Or

(b) If $y = \left(x + \sqrt{x^2+1}\right)^m$ show that $\left(1+x^2\right)y_{n+2} + (2n+1)\,x\,y_{n+1} + \left(n^2 - m^2\right)y_n = 0.$

18. (a) Find the equation of the circle of curvature at the point $(1,1)$ on the curve $x^3 + y^3 = 2$.

Or

(b) Obtain the equation of the evolute of the curve $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$.

19. (a) Obtain the Fourier series expansion of $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(-2+x), & 1 \le x \le 2 \end{cases}$ in the interval $(0,2)$.

Or

(b) Find the Fourier series expansion of $f(x) = \begin{cases} -\pi \text{ when } -\pi < x < 0 \\ x \text{ when } 0 < x < \pi \end{cases}$.

20. (a) Diagonalise $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

Or

(b) Reduce the quadratic form $2x_1x_2 + 2x_2x_3 + 2x_3x_1$ to Canonical form by orthogonal transformation.

(5 × 10 = 50 marks)

D 73695 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2019

CE 19 101—BASICS OF CIVIL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. List out the structural components of a residential building.
2. Explain transportation and water resource engineering.
3. List out the factors to be considered in the selection of site for a building.
4. List out the open space requirements for a building.
5. Write short note on site plan of a building.
6. Define plot area, plinth area, floor area and carpet area.
7. Explain the method of reciprocal levelling. When do you need it ?
8. List the various uses of contour maps.
9. Draw a neat sketch of Dumpy level and mark the salient features.
10. What are the properties of cement mortar ?
11. List out the advantages of RCC over PCC.
12. What is meant by curing of concrete ? Why it is necessary ?
13. List out the advantages of brick masonry over stone masonry.
14. Define safe bearing capacity of soil, and explain its importance in foundation design.
15. What are the functions of good foundation in buildings ?

(10 × 5 = 50 marks)

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) Explain in detail the different types of building according to NBC.

Or

(b) Describe in detail the contribution of civil engineering to the welfare of the society.

17. (a) Draw a rough sketch of the section of a simple storied building and mark the basic building components.

Or

(b) Explain the points to be considered while selecting the position of doors and windows in a building.

18. (a) What are the fundamental principles of surveying ? Explain briefly.

Or

(b) Write short notes on : (a) Remote sensing ; and (b) Geographical Information System.

19. (a) State the important properties and uses of cement mortar.

Or

(b) What is R.C.C.? Briefly write on desirable properties and uses of concrete.

20. (a) Explain different types of bonds used in brick masonry with sketches.

Or

(b) Explain the functional features of road, bridges and dam.

(5 × 10 = 50 marks)

D 73694 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

IT 19 100—INTRODUCTION TO COMPUTING AND PROBLEM SOLVING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. How to express algorithms ?
2. Differentiate between a microcomputer and a microprocessor.
3. List the characteristics of a computer.
4. Explain what do you mean by memory hierarchy ?
5. List the different type of storage devices.
6. What is the purpose of the main memory in a computer ?
7. Name and explain the various data type used in Python language.
8. Give the result of the following Python expressions :
   (i) 273. (ii) I = 2.
   (iii) 3 in [2, 7, 5.3, 4, 12].
9. Differentiate between input() and raw input() functions in Python.
10. With suitable example discuss any two integer oriented function.
11. Illustrate fseek and ftell function.
12. What are the common uses of rewind and ftell function ?
13. Describe the use and limitations of the functions getc and putc.
14. What do you mean by dictionaries ? Give its operations.
15. Give a brief idea of classes and objects.

(10 × 5 = 50 marks)

Part B

Answer section (a) or section (b) of each question.
Each question carries 10 *marks.*

16. (a) What are the essential components of a computer ? With help of block diagram discuss the function of each component.

Or

(b) What is the various computer generations ? Discuss main features of each generation with example.

Turn over

17. (a) Write an algorithm to insert n element from a linked queue depending upon users choice. Why do we have variety of memories in a computer system ?

Or

(b) Define and explain with suitable example the term Macro. List the properties of application software.

18. (a) Write a Python program to add an element 5 to a list x = [1, 2, 3] and to print that element.

Or

(b) Write a program in Python to swap two numbers.

19. (a) Given any three numbers. Write a program to write their values in an ascending order.

Or

(b) Write a program to illustrate the use of objects as arguments to member, and nonmember functions using Call By Value mechanism.

20. (a) Explain the four attributes of classes. Write down the general form of class definition.

Or

(b) Write a program using a class to store price list of 50 items and to print the largest price as well as the sum of all prices.

(5 × 10 = 50 marks)

D 73693 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

PT 19 100—CONCEPTS OF PRINTING TECHNOLOGY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Discuss various substrates used before the invention of paper.
2. Write notes on commercial printing shops.
3. Compare die-cutting, perforation and punching operations with its applications.
4. Describe book and different stages of book making.
5. Explain various parts of book required for publishing.
6. Compare traditional publishing and digital publishing.
7. What is the application of internet in printing industry ? Brief.
8. What are the functions of an operating system ?
9. Write notes on wireless networks.
10. Discuss the features required by images used for printing.
11. What are the advantages of image editing ?
12. How does light affect color ?
13. Compare warm and cool colors.
14. Write notes on hue, value and saturation.
15. What are the advantages and disadvantages of offset printing ?

(10 × 5 = 50 marks)

Part B

Answer one full question from each section.
Each question carries 10 *marks.*

16. a) i) Discuss the development of phonetic symbols.

(5 marks)

ii) Explain various stages of printing cycle.

(5 marks)

Or

b) Discuss the evolution of printing.

Turn over

17. a) Explain different types of print media.

Or

b) Compare book printing and book publishing.

18. a) Describe computer network and explain its types.

Or

b) Explain the working principle of various types of digital printing technologies.

19. a) Describe scanner, its purpose and types.

Or

b) Discuss the features of various image file formats.

20. a) i) Compare Sheet-fed offset and web offset printing. (5 marks)

ii) Discuss the principle and application of offset printing. (5 marks)

Or

b) i) Explain color printing process. (5 marks)

ii) Write notes on neutral colors, additive colors and subtractive colors. (5 marks)

[5 × 10 = 50 marks]

D 73692 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

ME 19 101—BASICS OF MECHANICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What is the effect of compression ratio on the thermal efficiency of Otto cycle ?
2. With help of p-V and T-S diagram explain the various processes involved in a Carnot cycle.
3. Derive an equation for the air standard efficiency of Otto cycle in terms of the engine compression ratio.
4. What is the concept of MPFI ?
5. Differentiate between SI and CI engine.
6. What are the advantages of belt drive over other drive ? What are the disadvantages ?
7. Why do we require CFC free refrigerants for refrigeration ? What are the ecological problems in using CFC refrigerats ?
8. Differentiate between impulse and reaction turbine.
9. What is function of air vessel in reciprocating pump ?
10. What is the difference between conventional and non conventional energy sources ?
11. What are the advantages and disadvantages of hydel power plant ?
12. List the nuclear power plants in India.
13. Explain closed die forging process with the help of neat sketch.
14. Discuss the effect of alloying elements to steel.
15. Define grinding. What are the practical applications of grinding ?

(10 × 5 = 50 marks)

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) 1 kg of air having an initial volume of 0.3 m^3 is heated at constant pressure of 3.2 bar until the volume is doubled. Find : (a) heat added , and (b) work done. Take c_p = 1.005kJ/kg.K, c_v = 0.718 kJ/kg.K.

Or

Turn over

(b) 0.5 kg of air is compressed reversibly and adiabatically from 80 kPa, 60° C to 0.4 MPa, and is then expanded at constant pressure to the original volume. Calculate the heat transfer and work transfer for the whole path. Take R = 0.287 kJ/kg.K, c_p = 1.005 kJ/kg. K and c_v = 0.718 kJ/kg.K

17. (a) Explain the working principle of 4 stroke petrol engine with the help of neat sketch.

Or

(b) What is meant by gear train ? Explain epicyclic gear train.

18. (a) Explain the working principle of centrifugal pump.

Or

(b) What is the principle of working of vapour compression refrigeration system ?

19. (a) Draw the layout of a Diesel power plant and explain.

Or

(b) Explain the various types of renewable energy sources.

20. (a) What factors influence the selection of a material for an engineering application ?

Or

(b) What are the various operations that can be performed in a lathe ? Explain any two of them.

(5 × 10 = 50 marks)

(b) 0.5 kg of air is compressed reversibly and adiabatically from 80 kPa, 60° C to 0.4 MPa, and is then expanded at constant pressure to the original volume. Calculate the heat transfer and work transfer for the whole path. Take R = 0.287 kJ/kg.K, c_p = 1.005 kJ/kg.K and c_v = 0.718 kJ/kg.K

17. (a) Compare SI engines with CI engines.

Or

(b) With the help of neat sketch explain the working of single plate clutch.

18. (a) Explain the working principle of reciprocating pump.

Or

(b) What are the important properties that are required for an ideal refrigerant ?

19. (a) Explain the working principle of Hydel power plant with the help of neat sketch.

Or

(b) Explain the various types of non renewable energy sources.

20. (a) Describe the various milling operations.

Or

(b) What are the various operations that can be performed on a shaper machine ? Explain any four of them.

(5 × 10 = 50 marks)

D 73691 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

ME 19 100—CONCEPTS OF MECHANICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What is meant by ideal cycle or air standard cycle ? What is its use ?
2. Draw the p-V and T-S diagram for diesel cycle.
3. 'Carnot cycle engine cannot be realized in practice'. Justify the statement.
4. Describe the various parts of IC engine.
5. Explain the creep and slip in belt drive.
6. What are the different types of brakes and its application ?
7. What is meant by eco-friendly refrigerant ? Why do we need it ?
8. What is the function of volute casing in centrifugal pump ?
9. Why priming is required in pump ?
10. What is geo thermal energy ?
11. What is a chain reaction ?
12. List out the advantages and disadvantages of thermal power plant.
13. What are the various applications of alloy steel ?
14. List out the merits and demerits of CNC machines over conventional machines.
15. Distinguish between direct and indirect extrusion.

(10 × 5 = 50 marks)

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) 5 m^3 of gas at 8 bar and 180° C is heated keeping the pressure same throughout till the volume is doubled. Find the heat added, external work done and the change in internal energy during the process. Take c_p = 1.005 kJ/kg.K, c_v = 0.718 kJ/kg.K.

Or

Turn over

D 73690 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

EE 19 101—BASICS OF ELECTRICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain how circuit elements are classified ? Draw a basic electric circuit.
2. A resistor of 5 Ω is connected in series witha parallel combination of 6 Ω and 3 Ω. Find the supply current taken from a 35 V d.c. source.
3. A 40 W, 100 V lamp is connected to a 230 V. Calculate the value of resistance required to connect the bulb in series to safety of the bulb.
4. A circuit has inductance $1/\pi$ Henry and resistance 200 Ω. A supply of 50 cycles per second A.C is applied to it. Calculate the reactance and impedance offered by the circuit.
5. With suitable example illustrate the phenomenon of electromagnetic induction.
6. Discuss the application of magnetic circuits.
7. With necessary sketch briefly explain the generation of ac.
8. Define co-efficient of coupling. Obtain an expression.
9. What do you meant by Q factor of LCR circuit ? Explain.
10. Briefly explain the constructional details of dc machine.
11. Give the principle of operation of a single phase transformer.
12. A transformer has 100 turns of wire on its primary winding and 20 turns of wire on its secondary winding. If the supply voltage is 200 V, calculate the secondary voltage.
13. Distinguish between squirrel cage and slip ring induction motor.
14. Draw a labeled block diagram of solar power plant.
15. What are the advantages of tidal power system ?

(10 × 5 = 50 marks)

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) Draw the characteristics of an ideal and practical voltage source. With a diagram explain how a practical current source can be converted to ideal current source.

Or

(b) Explain with suitable example the methods formation of network equations by mesh current and node voltage.

17. (a) List the similarities and dissimilarities between magnetic and electric circuits.

Or

(b) The magnetic flux density inside a toroid having 3200 turns with inner and outer radii 10 cm and 11 cm is 2.5 T. for a current of 0.8 A. Calculate the relative permeability of the core.

18. (a) Explain the concept of active power, reactive power and apparent power Draw power triangle to represent these three.

Or

(b) What is meant by phase sequence in 3-phase system ? Discuss the main advantage of two wattmeter method in measuring three phase power.

19. (a) An 8 pole dc generator has 650 armature conductors. The flux per pole is 20 milli webers. Find the value of e.m.f. generated when the armature is wave wound and is rotating at a speed of 1200 r.p.m. At what speed the armature should be driven to generate the same e.m.f., if the armature is lap wound.

Or

(b) A d.c. shunt generator has a terminal voltage of 220 V, field current of 0.5 A and load current of 12 A. Find the induced voltage in the armature resistance is 0.2 Ω.

20. (a) Explain the various advantages and disadvantages of three phase induction motors.

Or

(b) With help of block diagram of hydroelectric generating station explain the various parts and discuss its working.

(5 × 10 = 50 marks)

D 73689 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2019

EE 19 100—CONCEPTS OF ELECTRICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain how circuit elements are classified ? Draw a basic electric circuit.
2. A resistor of 50 Ω is connected in series with a parallel combination of 60 Ω and 30 Ω. Find the supply current taken from a 35 V d.c. source.
3. A 40 W, 100 V lamp is connected to a 230 V. Calculate the value of resistance required to connect the bulb in series to safety of the bulb.
4. Derive an expression for sinusoidal voltage and current.
5. Derive the equation for r.m.s. value of an AC.
6. An alternating current is given by I = 14.14 sin 377t. Find (a) r.m.s. value of current ; (b) Frequency ; (c) Average value of current ; and (d) Form factor.
7. A circuit has inductance $1/\pi$ Henry and resistance 200 Ω. A supply of 50 cycles per second A.C. is applied to it. Calculate the reactance and impedance offered by the circuit.
8. What do you mean by Q factor of LCR circuit ? Explain.
9. An A.C. series circuit has L = 10 mH, C = 10 μF, R = 10 Ω. Calculate (i) Natural frequency ; and (ii) Resonant frequency ; and (iii) Impedance of the circuit at resonance.
10. A lamp connected in parallel with a large inductor glows brilliantly when the current is switched off. Explain.
11. Compare electric and magnetic circuit.
12. Derive an expression for energy stored in a magnetic field.
13. What is meant by coupling coefficient of a magnetic circuit ?
14. A transformer has 100 turns of wire on its primary winding and 20 turns of wire on its secondary winding. If the supply voltage is 200 V, calculate the secondary voltage.
15. Derive an expression for energy stored in a capacitor.

(10 × 5 = 50 marks)

Turn over

Part B

Answer section (a) **Or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) Draw the characteristics of an ideal and practical voltage source. With a diagram explain how a practical current source can be converted to ideal current source.

Or

(b) State and prove Superposition theorem.

17. (a) Obtain an expression for current and voltage in an alternating current circuit consisting of resistance R and inductance L in series. Show that current lags behind voltage.

Or

(b) Define and explain reactance and impedance of an alternating current circuit. Explain rectangular and polar representation of phasors.

18. (a) Explain the concept of active power, reactive power and apparent power. Draw power triangle to represent these three.

Or

(b) A resistive load takes 10 A at 100 V. Calculate the inductance of the reactor to be connected in series with this load in order that the same current is supplied from 220 V, 50 Hz main.

19. (a) Using Biot and Savart law derive an expression for the magnetic field due to an infinite straight wire carrying current. Give the concept of solenoid and toroid.

Or

(b) Derive an expression for the force on a current carrying conductor in a magnetic field.

20. (a) Explain in detail the construction, theory and uses of a transformer. What are energy losses and how are they minimized ?

Or

(b) What is rotating magnetic field ? Explain how a rotating magnetic field is established ? Describe how it is used in the working of a single-phase motor.

(5 × 10 = 50 marks)

D 73688 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2019

EC 19 101—BASICS OF ELECTRONICS ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Discuss the colour code for ceramic capacitors. What is the colour band of 5 Ω ± 1 %.
2. Two resistors of 100 Ω . 1W are connected in series and parallel. Find total resistance and wattage in both cases.
3. Define temperature co-efficient of resistance. Derive an expression for the same.
4. Draw the energy band diagram of conductors, insulators and semiconductors.
5. Give the principle of operation of PN junction diode.
6. Draw the VI characteristics of Zener diode and explain its working.
7. Explain the significance of the truth table of a logic gate with suitable example.
8. State and explain De-Morgan's law and give its application.
9. Draw the block diagram of dc power supply and explain.
10. Draw the frequency response of an amplifier and indicate the bandwidth.
11. Briefly explain the working principles of oscillators.
12. Draw the block diagram of operational amplifier and explain its function.
13. Explain few needs for modulation.
14. Give the basic principle for cellular communication.
15. With help of block diagram explain the principle of optical communication.

(10 × 5 = 50 marks)

Part B

Answer section (a) **or** *section* (b) *of each question.*
Each question carries 10 *marks.*

16. (a) Compare the characteristics, rating and field of applications of various types of capacitors.

Or

(b) How inductors are classified. Explain in detail with its applications.

Turn over

17. (a) Draw the structure of LED and explain the mechanism of its operation. State the uses of LED.

Or

(b) Draw the circuit of an *n-p-n* BJT in CE configuration and sketch the output characteristics. Show the load line and maximum power dissipation curve on the same characteristics.

18. (a) Define a voltage regulator. Classify it. Draw the circuit of a simple zener diode dc voltage stabilizer. Mention its merits and demerits.

Or

(b) Draw the block diagram and explain the working of a 4-bit binary adder.

19. (a) With help of circuit diagram explain the principle and working of RC phase shift oscillator.

Or

(b) Draw the block diagram of OPAMP and list its characteristics. Explain its use as an inverting and non inverting amplifier.

20. (a) Define AM. Draw an AM wave and derive an expression for total power of an AM signal.

Or

(b) With help of block diagram explain the working of FM transmitter. Distinguish between AM and FM.

(5 × 10 = 50 marks)

D 73687 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2019

EC 19 100—CONCEPTS OF ELECTRONIC ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Briefly explain the structure and advantages of electrolytic capacitors.
2. Distinguish between metal film resistors and wire wound resistors.
3. Give a short account of relays and contractors. Mention its applications.
4. With help of energy band diagram explain the basic concepts of semiconductors.
5. Derive the diode current equation of PN junction diode.
6. Differentiate between Zener and Avalanche breakdown mechanisms .
7. Draw the VI characteristics of CE configuration. Mark all regions give its importance.
8. Discuss two methods for biasing a transistor.
9. Explain the function of a transistor as a switch.
10. Explain FET operation.
11. Discuss the advantages of MOSFET.
12. Explain the principle of operation of Photo transistor.
13. What is Lissajous patterns ?
14. Compare the properties of analog and digital computer.
15. Explain the principle of function generator and give its important application.

(10 × 5 = 50 marks)

Part B

Answer section (*a*) **or** *section* (*b*) *of each question.*
Each question carries 10 *marks.*

16. (a) With necessary diagram, explain the construction, working, rating and applications carbon composition type resistors.

Or

(b) Explain the principle of low power transformers. Distinguish between multilayer and variable inductors.

Turn over

17. (a) Explain the working of capacitor input filter and choke input filter.

Or

(b) Draw the structure of LED and explain the mechanism of its operation. Give its applications.

18. (a) Explain in detail an experiment to study the input and output characteristics of common emitter configuration of transistor.

Or

(b) Explain the working of an RC coupled amplifier. Draw the d.c and a.c load line.

19. (a) With a neat diagram explain the structure of UJT and its electrical equivalent. Explain its characteristics and its important applications.

Or

(b) What is SCR ? What do you mean by holding current of an SCR ? Explain the action of gate on the triggering of an SCR.

20. (a) What are the generalized parameters of electronic instruments. Explain in detail.

Or

(b) Draw the labeled block diagram of CRO and give its working.

(5 × 10 = 50 marks)

D 73686 (Pages : 4) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2019

EM 19 100—ENGINEERING MECHANICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain position vector and unit vector with suitable examples. What is the condition for a position vector to be a unit vector ? Specify the vector using a Cartesian system.
2. Define Parallelogram law of vector analysis using suitable example.
3. State the conditions of equilibrium for coplanar concurrent and non-concurrent systems.
4. Comment on the statement, "Friction a necessary evil". Justify with suitable examples.
5. Define friction and the cause for it using a diagram. State the concept of coefficient of friction.
6. Determine the minimum normal force required to place a block of mass 10 kg. on wall surface. Consider the coefficient of friction between the wall and block to be 'μ'.
7. With the help of suitable figures, briefly explain the theorem of Pappu's-Guldinus.
8. What is the moment of inertia of a simple 'L' section? Derive a generalised equation for the same.
9. Briefly explain the concept of Polar moment of Inertia with suitable diagram.
10. Define the concept of Instantaneous centre. What is instantaneous centre of zero velocity. Use necessary diagrams.
11. Define Newton's law of translator motion. Derive the equation for force using the law then relate it to momentum.
12. With the help of mathematical relations define D' Alembert's principle.
13. With necessary diagram represent spring mass model of series and parallel connection.
14. A body is vibrating with simple harmonic motion of amplitude 150 mm and frequency 3 cps. Calculate maximum velocity and acceleration of the body.
15. What are the conditions to be satisfied for a periodic motion to be in SHM ? Using a diagram briefly describe the SHM of a particle moving along the circumference of a circle of radius 'r' and with uniform angular velocity.

(10 × 5 = 50 marks)

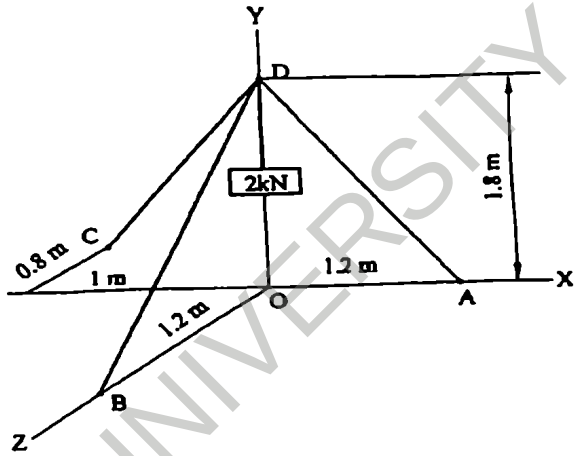
Part B

Answer on full section from each question.
Each question carries 10 *marks.*

16. (a) A rope 9 m. long is connected at A and B, two points on the same level, 8 m. apart. A weight of 30 kg. is suspended from a point C on the rope, 3 m. from A. What weight should be connected to a point D, on the rope 2 m. from B to keep portion CD parallel to AB. Draw necessary diagram to explain the problem.

Or

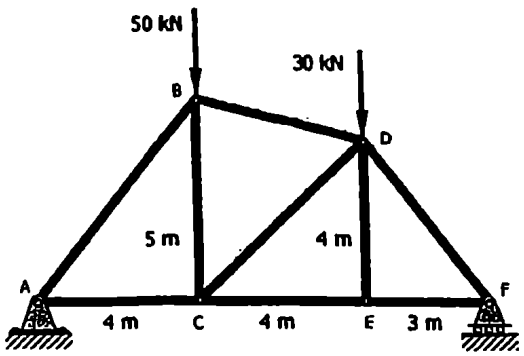
(b) A tripod supports a load of 2 kN as shown in figure. The ends A, B and C are in the X-Z plane. Find the force in the three legs of the tripod.



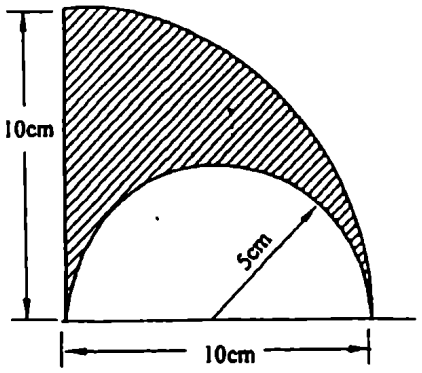
17. (a) A body resting on a rough horizontal plane required a pull of 180 N inclined 30° to the plane just to move it. It was found that a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction.

Or

(b) Compute the force in all members of the truss as shown in figure using method of joints.

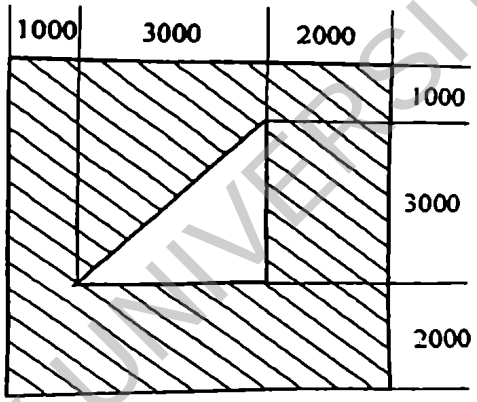


18. (a) Determine the centroid of the shaded area obtained by cutting a semi-circular section of diameter 10 cm. from the quadrant of a circle of radius 10 cm. as shown in figure.

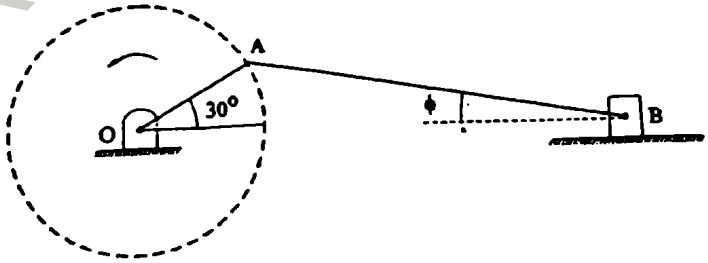


Or

(b) Calculate the moment of inertia of the shaded region as shown in figure with respect to the centroidal axes.

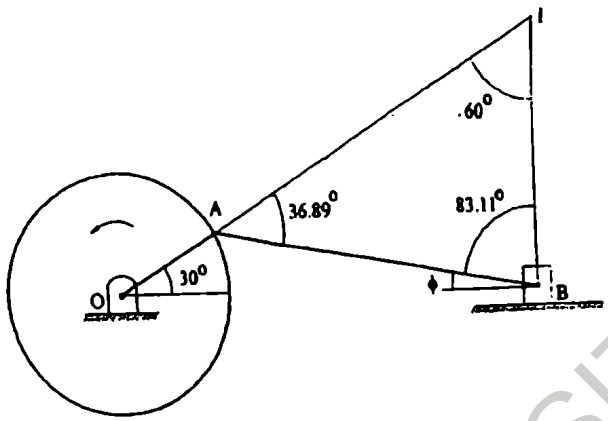


19. (a) In the reciprocating engine mechanism as shown in figure, the crank OA rotates at a uniform speed of 300 r.p.m. The lengths of crank and connecting rod are 12 cm. and 50 cm. respectively. Find (i) The angular velocity of the connecting rod AB ; (ii) The velocity of piston when the crank makes an angle of 30° with horizontal.



Or

(b) In the reciprocating engine mechanism as shown in figure, the crank OA rotates at a uniform speed of 300 r.p.m. The lengths of crank and connecting rod are 12 cm. and 50 cm. respectively. Find (i) The angular velocity of the connecting rod AB ; and (ii) The velocity of piston when the crank makes an angle of 30° with horizontal. Use instantaneous centre approach.



20. (a) A body moving with SHM has velocities of 10 m/s and 4 m/s at 2 and 4 m. distance from the mean position. Find the amplitude and time period of the body.

Or

(b) Find the time period of oscillation of a simple pendulum of length 1.5 m. Also find the time period when this pendulum hangs from an elevator moving with (i) Upward acceleration of 3 m/s^2 ; and (ii) Downward acceleration of 3 m/s^2.

(5 × 10 = 50 marks)

D 73685 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

GS 19 100—ENGINEERING GRAPHICS

Time : Three Hours Maximum : 100 Marks

Answer **three** *questions from Part A and any* **two** *questions from Part B.*
All questions carry equal marks.

Part A

1. (a) The end A of an 80 mm. long line AB is 20 mm. above H.P. and B is 15 mm. in front of the V.P. The line is inclined at 30° to the H.P. and its top view makes 60° with the V.P. Draw its projection and finds its inclination with the V.P.

Or

(b) A Hexagonal plane with a 30 mm. side has its corner A in the H.P. The surface of the plane is inclined at 45° to the H.P and the diagonal containing the corner A is inclined at 30° to the V.P. Draw its projection.

2. (a) A cone, having a base with a 50 mm. diameter and a 65 mm. long axis, has one of its generators in the V.P. and is inclined at 30° to the H.P. Draw its projections, when its apex being 10 mm. above the H.P.

Or

(b) A square pyramid side of base 50 mm. and axis height 70 mm. is kept with its base on H.P. It is cut by a section plane perpendicular to VP which contains one of the base corners and is perpendicular to the slant edge opposite to this base corner: Draw the sectional plan, elevation and true shape of the section.

3. (a) A largest rhombus is made in a thin rectangular plate with 190 mm. sides and 90 mm. sides. The plate is then wrapped to form a cylinder. Draw the projection of the cylinder with the rhombus marked on it.

Or

(b) A hexagonal prism having base with a 30 mm. side and 40 mm. height is surmounted by a hemisphere such that the hemisphere is touching all the edges of the top face. Draw the isometric projection of the arrangement.

(3 × 20 = 60 marks)

Turn over

Part B

Answer any **two** *questions.*
Each question carries 20 *marks.*

4. (a) Draw the perspective projection of a pentagonal prism of side 20 mm. and length 40 mm, lying on one of its rectangular faces on the ground plane and one pentagonal face touching the picture plane. The station point is 40 mm. in front of the picture plane and lies in the central plane which is 45 mm. right to the centre of the prism. Station point is 45 mm. above the ground plane.

(b) Draw three views of a hexagonal nut for M 30 bolt. Insert all the dimensions of the nut.

(c) A cone, with a 60 mm. base diameter and a 70 mm. long axis, is resting on its base on the H.P. It is cut by an A.I.P, making 45° with the H.P. and passing through a point on the axis, 20 mm. above the base. Draw its sectional top view and obtain true shape of the section.

(2 × 20 = 40 marks)

D 73684 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

CH 19 100—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Write a note on primary treatment of municipal water purification.
2. Distinguish between addition and condensation polymerisation.
3. Mention any five uses of conducting polymers.
4. Explain the following terms : (i) Cloud and Pour point ; (ii) Aniline point.
5. Distinguish between Gross and Net calorific value of a fuel.
6. Write a note on Cetane number.
7. Discuss the important properties of nano tubes.
8. Write short notes on : (i) Fullerenes (ii) Dendrimers.
9. Write briefly about : (i) safer solvents (ii) Energy efficiency by design.
10. What is standard hydrogen electrode ? Write the electrode reactions.
11. Derive an expression for EMF of concentration cells.
12. Give the principle of glass electrode. How is it constructed ?
13. Why metal under water drop undergoes accelerated corrosion ?
14. Give the pilling Bedworth rule in corrosion with example.
15. Differentiate Galvanising and Tinning.

(10 × 5 = 50 marks)

Part B

Answer any **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) Explain how demineralisation of water can be done by ion exchange with a neat diagram.

Or

(b) Explain different types of conducting polymers and the mechanism involved in the conduction.

Turn over

17. (a) Explain the mechanism of lubrication with neat diagrams.

Or

(b) Describe the experimental determination of calorific value of a solid fuel.

18. (a) Write notes on : (i) Engineering applications of nanomaterials ; (ii) Synthesis of nanomaterials by hydrolysis.

Or

(b) (i) What is green chemistry and how is it important ?

(ii) Write briefly about one engineering application of green chemistry.

19. (a) What are accumulators ? Explain lead acid accumulator with equations.

Or

(b) State and explain Nernst equation. What are its applications ?

20. (a) Explain the electrochemical mechanism of rusting of iron in humid atmosphere. Mention any four factors that affect rate of corrosion.

Or

(b) Define electroplating. Explain the process with neat diagram and give the role of the following factors on the nature of the electrodeposit, (i) Current density (ii) pH.

(5 × 10 = 50 marks)

D 73683 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, NOVEMBER 2019

PH 19 100—ENGINEERING PHYSICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What are non-reflecting films ? Give its applications.
2. A plane grating just resolves two lines in the second order. Calculate the grating element if $d\lambda = 1$ Å, $\lambda = 6000$Å and which of the rule surface is 2 cm.
3. Discuss the various types of polarized light.
4. With suitable example explain linear operators in quantum mechanics.
5. Explain the phenomenon of tunneling and give its importance in physics.
6. With suitable example explain bosons and fermions.
7. Discuss the solution of one dimensional wave equation.
8. Explain the concept of opposite phase and in phase with suitable example.
9. The intensity of sound is increased to 100 times. Express the change in decibels.
10. A fiber has a core diameter of 6 μ m and core refractive index 1.45. Refractive index of the cladding is 1.448. Determine the maximum number of modes allowed to propagate through the fiber, if the wavelength of light used is 1 μ m.
11. Give qualitative ideas of semiconductor laser.
12. Distinguish between d.c. Josephson effect and a.c. Josephson effect.
13. A He-Ne laser emits light at a wavelength of 632.8 nm and has an output power of 2.3mW. How many photons are emitted in each minute by this laser when operating ?
14. Discuss the type of pumping method used in ruby laser. Also draw the energy level diagram of a ruby laser.
15. Give a qualitative account of SQUID.

(10 × 5 = 50 marks)

Part B

Answer section (a) **or** *section (b) of each question.*
Each question carries 10 *marks.*

16. (a) Explain how Newton's rings are formed. Obtain an expression for the radii of bright and dark rings in a reflected system.

Or

(b) Explain the action of plane transmission grating. How it is produced ? What is the effect of increasing the number of lines on grating ?

17. (a) (i) Calculate the first four energy values of an electron in a one dimensional box of width L = 1 Å in eV. Also compute the probability for finding the particle in between 0 and L/4 in the ground state.

(ii) Deduce Schrodinger time dependent equation from the operators for position and momentum.

Or

(b) Explain the following :

(i) Postulates of BE statistics.

(ii) Conditions under which a quantum distribution approaches classical one.

18. (a) Discuss in details the various factors affecting acoustics of a building.

Or

(b) Explain the thermal method of detection of ultrasonic waves. Describe one method of non destructive testing using ultrasonic waves. Mention four medical application of ultrasonic waves.

19. (a) With block diagram explain the different stages of fibre optic communication system.

Or

(b) Explain the following :

(i) Solar cells and its VI characteristics.

(ii) Photovoltaic cells.

20. (a) What is the principle of holography ? With diagram explain how is a hologram recorded and reconstructed ? List its applications.

Or

(b) What is Meissonier effect ? Explain high temperature superconductors. Distinguish between Type 1 and Type 11 superconductors.

(5 × 10 = 50 marks)

D 73682 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.TECH. (ENGINEERING) [2019 SCHEME] DEGREE EXAMINATION, NOVEMBER 2019

MA 19 100—CALCULUS AND LINEAR ALGEBRA

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Evaluate $\lim_{x\to\pi/2}(\sin x)^{\tan x}$.

2. Test the convergence of the following series :

   (i) $\sum_{k=2}^{\infty}\left(\frac{4k-5}{2k+1}\right)^k$; (ii) $\sum_{k=1}^{\infty}\frac{k^k}{k!}$.

3. Test the convergence of the series $\sum_{k=1}^{\infty}(-1)^{k+1}\frac{k+3}{k(k+1)}$. Is the series absolutely convergent.

4. Expand $\log x$ in powers of $x-1$.

5. Find the Maclaurin series expansion of $x \sin x$.

6. Find the nth derivative of $\cos x \cos 2x \cos 3x$ using Leibnitz formula.

7. If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=-\frac{1}{2}\cot u$.

8. Investigate the maximum and minimum values of $z = xy(3x+2y+1)$.

9. Find the radius of curvature of $4ay^2 = (2a-x)^3$ at $(a, a/2)$.

10. Find the rank of the matrix $A=\begin{bmatrix}2 & -1 & 3 & 4\\ 0 & 3 & 4 & 1\\ 2 & 3 & 7 & 5\\ 2 & 5 & 11 & 6\end{bmatrix}$.

11. Test for consistency and solve $2x+3y+4z=11$, $x+5y+7z=15$, $3x+11y+13z=25$.

12. Using Cayley-Hamilton theorem find the inverse of the matrix $A=\begin{bmatrix}1 & 2 & 3\\ 2 & -1 & 4\\ 3 & 1 & -1\end{bmatrix}$.

13. Find the half range cosine series expansion of $f(x) = 2x - 1$ in $0 < x < 1$.

14. Find the half range sine series expansion of $f(x) = \cos x$ in $0 < x < \pi$.

15. Obtain the Fourier series for the function $f(x) = |x|$ in $-\pi < x < \pi$.

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*
Each question carries 10 *marks.*

16. (a) Test the series for convergence $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}-1}$.

Or

(b) Test the convergence of the series :

$$x + \frac{2^2 x^2}{2!} + \frac{3^3 x^3}{3!} + \frac{4^4 x^4}{4!} + \ldots\infty.$$

17. (a) Obtain the expansion of $e^{\sin x}$ in ascending powers of x as far as the term in x^4.

Or

(b) If $y = a\cos(\log x) + b\sin(\log x)$ prove that $x^2 y_{n+2} + (2n+1)x y_{n+1} + (n^2+1)y_n = 0$.

18. (a) Find the circle of curvature of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at the point $\left(\frac{a}{4}, \frac{a}{4}\right)$.

Or

(b) Find the evolute of the parabola $y^2 = 4ax$.

19. (a) Find the Fourier series of period $2l$ for the function $f(x) = \begin{cases} l - x, & 0 \le x \le l \\ 0, & l \le x \le 2l. \end{cases}$

Or

(b) Find the Fourier series expansion of the periodic function of period 2π, $f(x) = x^2, -\pi < x < \pi$.

Hence deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots$.

20. (a) Reduce the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ to the diagonal form.

Or

(b) Reduce $8x_1^2 + 7x_2^2 + 3x_2^2 - 12x_1x_2 - 8x_2x_3 + 4x_1x_3$ into canonical form by orthogonal reduction.

(5 × 10 = 50 marks)