

C 83793

(Pages : 3)

Name.....

Reg. No.....

SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME]
EXAMINATION, APRIL 2020

MA 19 200—DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Time : Three Hours

Maximum : 100 Marks

Part A

Answer any ten questions.

Each question carries 5 marks.

1. Solve : $x \frac{dy}{dx} + y = x^3 y^6$.
2. Solve : $(x^2 - 4xy - 2y^2) dx + (y^2 - 4xy - 2x^2) dy = 0$.
3. Solve : $y \left(\frac{dy}{dx} \right)^2 + (x - y) \frac{dy}{dx} - x = 0$.
4. Solve : $(D^3 + 3D^2 + 3D + 1) y = e^{-x}$.
5. Solve : $(D^2 - 4D - 5) y = 4 \cos 2x$.
6. Solve by the method of variation of parameter $\frac{d^2 y}{dx^2} + a^2 y = \tan ax$.
7. Evaluate $\iint_R xy \, dA$ over the region R enclosed between $y = \frac{1}{2}x$, $y = \sqrt{x}$, $x = 2$ and $x = 4$.
8. Use a double integral to find the area of the region R enclosed between the parabola $y = \frac{x^2}{2}$ and the line $y = 2x$.

Turn over

9. Evaluate $\int_0^3 \int_0^{\sqrt{9-z^2}} \int_0^x xy \, dy \, dx \, dz$.
10. In what direction from $(3, 1, -2)$ is the directional derivative of $\phi(x, y, z) = x^2 y^2 z^4$ maximum and what is magnitude?
11. Find the angle between the surfaces $xy^2z = 3x + z^2$ and $3x^2 - y^2 + 2z = 1$ at the point $(1, -2, 1)$.
12. Find the constants a, b, c so that $\bar{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is irrotational. Find the scalar potential of \bar{F} .
13. If $\bar{F} = (3x^2 + 6y)i - 14yzj + 20xz^2k$ evaluate the line integral $\int_C \bar{F} \cdot d\bar{r}$ from $(0, 0, 0)$ to $(1, 1, 1)$ along the path $C : x = t, y = t^2, z = t^3$.
14. If $\bar{F} = (2x^2 - 3z)i - 2xyj - 4xk$, then evaluate $\iiint_V \nabla \cdot \bar{F} \, dV$, where V is bounded by the planes $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$.
15. Using Green's theorem in the plane to evaluate $\int_C (3x^2 - 8y^2) dx + (4y - 6xy) dy$ where C is the boundary of the region defined by $y = \sqrt{x}, y = x^2$.

(10 × 5 = 50 marks)

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

16. (a) Solve $(y - x - 4) dy = (y + x - 2) dx$.

Or

(b) Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$.

17. (a) Solve $x^3 \frac{d^3 y}{dx^3} + 3x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + 8y = 65 \cos(\log x)$.

Or

(b) Solve $(2x + 3)^2 \frac{d^2 y}{dx^2} - (2x + 3) \frac{dy}{dx} - 12y = 6x$.

18. (a) Evaluate $\int_0^a \int_{x^2/a}^{2a-x} xy \, dy \, dx$, by changing the order of integration.

Or

(b) Find the volume bounded by the xy -plane, the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$.

19. (a) (i) Find the value of n , if $r^n \bar{r}$ is both solenoidal and irrotational when $\bar{r} = xi + yj + zk$.

(ii) If ϕ and ψ are scalar point functions, prove that $\phi \nabla \phi$ is irrotational and $\nabla \phi \times \nabla \psi$ is solenoidal.

Or

(b) (i) Find the values of the constants a, b, c so that $\bar{F} = (axy + bz^3)i + (3x^2 - cz)j + (3xz^2 - y)k$ may be irrotational. For these values of a, b, c , find also the scalar potential of \bar{F} .

(ii) If $\bar{r} = xi + yj + zk$ and $r = |\bar{r}|$, then prove that $\nabla^2 r^n = n(n+1)r^{n-2}$.

20. (a) Verify the divergence theorem for the function $\bar{F} = x^2 yi + x^2 zk + x^3 i$ over the cylindrical region S bounded by $x^2 + y^2 = a^2, z = 0, z = 6$.

Or

(b) Verify Stoke's theorem for $\bar{F} = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by $x = \pm a, y = 0$ and $y = b$.

(5 × 10 = 50 marks)

C 83795

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE
[2019 SCHEME] EXAMINATION, APRIL 2020**

CH 19 100—ENGINEERING CHEMISTRY

Time : Three Hours

Maximum : 100 Marks

Part A

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

1. What are ion-exchange resins ? Give examples for cation and anion exchange resins.
2. Discuss cationic polymerization mechanism in detail.
3. What are conducting polymers ? Explain the mechanism of conduction of polyaniline.
4. What are the different types of greases ? How are they made ?
5. 0.83 g of a solid fuel on burning in a bomb calorimeter made the temperature of 3500 g of water to rise from 26.5°C to 29.2°C. If the fuel contains 0.7 % hydrogen, calculate the gross and net calorific value. Water equivalent of calorimeter = 385 g. Latent heat of steam = 587 Cal/gm.
6. Define octane number and cetane number. What is their significance ?
7. How fullerenes are obtained ? What are their special properties and uses ?
8. Discuss any *two* principles of green chemistry.
9. Give the properties and applications of carbon nanotubes.
10. Calculate the single electrode potential of zinc electrode at 27°C in a solution of $Zn^{2+} = 0.15$ M. If $E^\circ Zn/Zn^{2+} = 0.76$ V.
11. What are the characteristics of fuel cells ?
12. What is an electrochemical series ? What are its uses ?
13. Explain dry corrosion phenomenon.
14. Explain cementation process.
15. Write a short note on Galvanic series.

(10 × 5 = 50 marks)

Turn over

Part B

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

Each question carries 10 marks.

16. (a) Give an account of purification of Municipal water.

Or

(b) Explain the term glass transition temperature and various factors that affect T_g.

17. (a) What are lubricants ? Give the functions of a lubricant. Explain their classification based on their physical state with suitable examples.

Or

(b) What is reforming ? Explain with examples and reforming reactions. How does reforming increase octane number ?

18. (a) Write hydrolysis and reduction method of synthesis of nanomaterials.

Or

(b) Write short note on green solvents.

19. (a) What is standard hydrogen electrode ? How is it used to measure the standard electrode Potential ? Write the electrode reactions when it acts as an anode and cathode.

Or

(b) Explain Ni-Cd battery. What are its advantages and disadvantages ?

20. (a) Discuss the factors which influence corrosion.

Or

(b) Give an account of inorganic metallic coatings.

(5 × 10 = 50 marks)

C 83797

(Pages : 4)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE
[2019 SCHEME] EXAMINATION, APRIL 2020**

EM 19 100—ENGINEERING MECHANICS

Time : Three Hours

Maximum : 100 Marks

Part A

Answer any ten questions.

Each question carries 5 marks.

1. State the major difference between basic and derived units with valid examples. Quantify the force offered by the weight of 1 kg. of mass in static condition.
2. Explain the concept of static indeterminacy using a simple example.
3. Comment on the various basic laws of mechanics.
4. With the help of a neat diagram briefly define the cone of friction.
5. What are the laws of dry friction ?
6. Define angle of repose with a simple example.
7. What is the basic difference between centroid and centre of gravity. Provide suitable justifications.
8. Define parallel and perpendicular axis theorems.
9. Explain the analytical method for determining the centroid of composite areas.
10. Define the major differences between static and dynamic systems. Site real world examples for each.
11. Using mathematical equations, relate the rectangular co-ordinate system with cylindrical co-ordinate system for a curvilinear motion.
12. What is rectilinear motion? How is it different from that of a curvilinear motion?
13. What is the condition for a mechanical system under equilibrium to undergo vibration ?
14. Define forced and free vibration highlighting real life problems to justify each.
15. What are the basic elements of a vibrating system ?

(10 × 5 = 50 marks)

Turn over

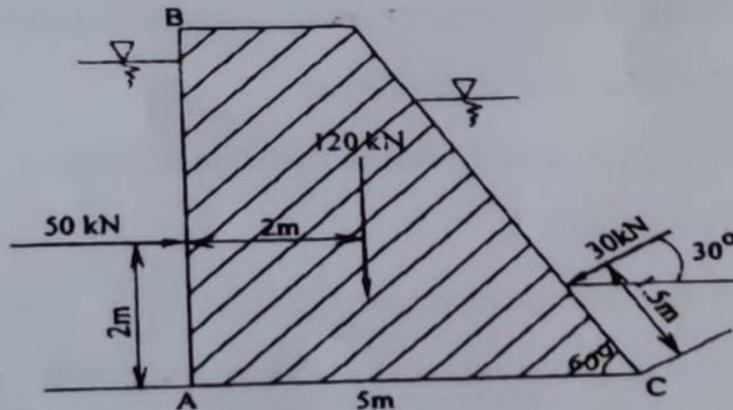
Part B

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

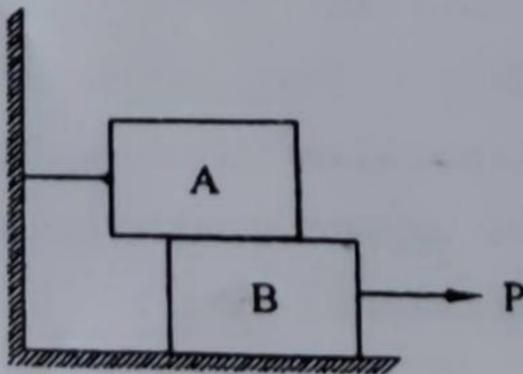
16. (a) Find the resultant and equilibrant of coplanar concurrent force systems. Use a detailed figure to define the force system.

Or

- (b) A dam is subjected to three forces, 50 kN force on the upstream vertical face AB, 30 kN force on the downstream inclined face and its own weight 120 kN. Determine the single equivalent force and locate its point of intersection with the base AC, assuming all the forces to lie in the same plane as shown in figure.

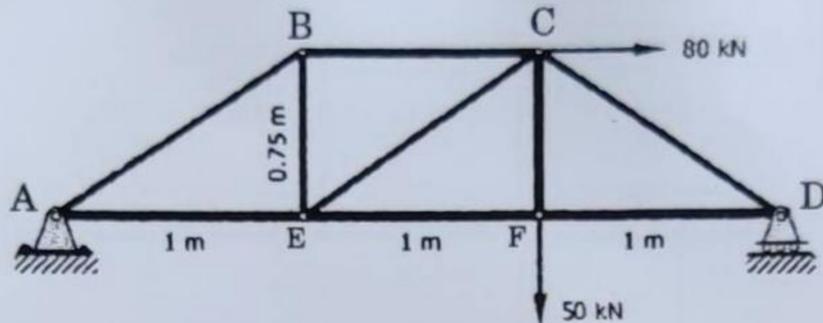


17. (a) Two blocks A and B of weights equivalent to 200 N and 300 N respectively. Find the force required to move block B. Assume the coefficient of friction for all surfaces to be 0.3.

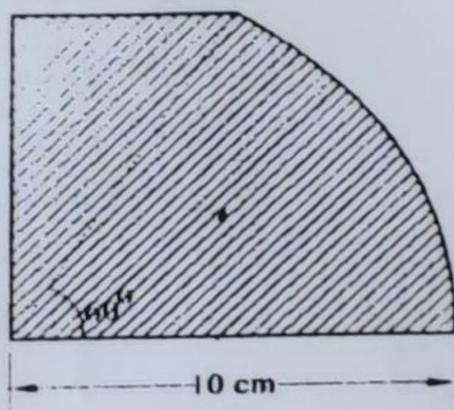


Or

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

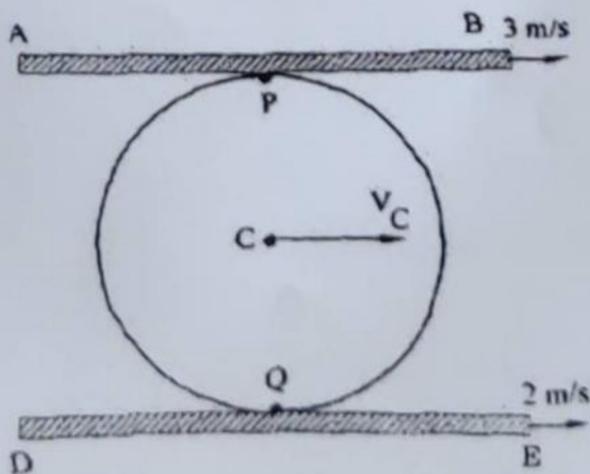


18. (a) Locate the centroid of the area as shown in figure.



Or

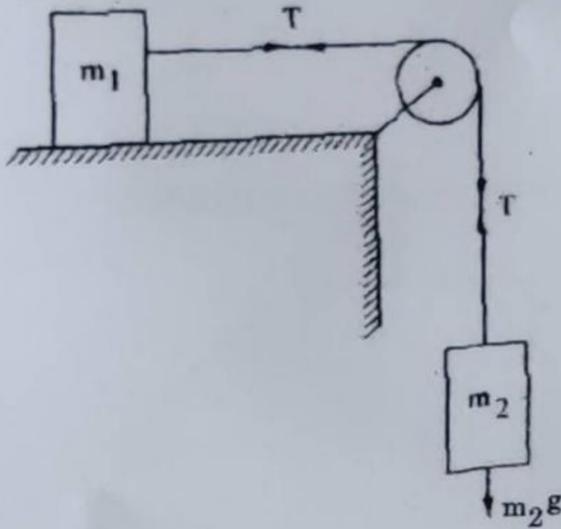
- (b) Determine the moment of inertia of a circular lamina about its centroidal axes.
19. (a) A cylindrical roller is in contact at its top and bottom, with two conveyor belts AB and DE as shown in figure. If the belts run at uniform speeds of 3 m/s and 2 m/s respectively, find the linear velocity and the angular velocity of the roller when, (i) the velocities are in the same direction and (ii) the direction of velocities are opposite. Consider the diameter of the roller to be 40 a.m.



Or

Turn over

- (b) A mass of 60 kg. lies on a smooth horizontal table. It is connected to a fine string passing over a smooth guide pulley on the edge of the table to a mass 50 kg. hanging freely. Find the tension in the string and the acceleration of the system.



20. (a) A body moving with SHM, has an amplitude of 1 m. and the period of oscillation is 2 seconds. Find the velocity and acceleration of the body at time $t = 0.4$ seconds, when time is measured from : (i) The mean position ; and (ii) The extreme position.

Or

- (b) A particle moving with SHM has an amplitude of 4.5 m. and period of oscillation is 3.5 seconds. Find the time required by the particle to pass two points which are at a distance of 3.5 m. and 1.5 m. from the centre and on the same side of mean position.

(5 × 10 = 50 marks)

C 83799-A

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME]
EXAMINATION, APRIL 2020**

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. Explain the construction of fixed and variable inductors. Give two applications of each.
2. Discuss the differences in electrical action of inductors and capacitors.
3. Discuss the principle and working of relays and contactors.
4. Distinguish between intrinsic and extrinsic semiconductors.
5. Explain the principle of working of Zener diode.
6. Explain the input and output characteristic of common emitter configuration.
7. Explain the role of filter in a power supply. List the advantages of Full wave rectifier compared to half wave rectifier.
8. Realize two input X-OR gate using only NAND gates.
9. 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.
10. In a phase-shift oscillator, the three RC networks are identical with $R = 100 \Omega$ and $C = 0.05 \mu\text{F}$. Find the frequency of oscillation.
11. Define current gain, voltage gain, and power gain of a CE amplifier.
12. Explain the concept of feedback with a neat diagram.
13. Explain the principle of AM demodulation with a neat circuit diagram.
14. Compare AM and FM.
15. Give the basic principle of cellular 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) List and explain the different passive components used in electronic industry.

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 solar cell. Discuss the importance of material used for its construction.

18. (a) With help of a block diagram explain the parts of a D.C. power supply and discuss the function of each block.

Or

- (b) What is a voltage regulator ? With a circuit diagram explain the principle and working of Zener voltage regulator. Draw the characteristics of Zener diode. What is SMPS ?

19. (a) Explain the working principle of oscillators. Elaborate in detail with circuit diagram the principle and working of 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) Define Modulation index in FM. 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. What are the advantages of optical communication ?

(5 × 10 = 50 marks)

C 83799-B

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME]
EXAMINATION, APRIL 2020**

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. Briefly explain open circuit voltage and short circuit current.
2. A resistor of $5\ \Omega$ is connected in series with a parallel combination of $6\ \Omega$ and $3\ \Omega$. Find the supply current taken from a 35 V d.c. source.
3. Explain the method of Star / Delta transformation.
4. Define MMF, Field strength, flux density and reluctance.
5. State and explain Lenz's law. Give its application.
6. Distinguish between statically induced e.m.f. and dynamically induced e.m.f.
7. Obtain the effective value of a.c. of a half rectified sine wave.
8. Define Form factor of a sine wave. What is its value ?
9. A sinusoidal e.m.f. of frequency 50 Hz has r.m.s. value of 250 V. Calculate its instantaneous value 0.0025 second after the instant at which the e.m.f. is zero and then decreasing.
10. Draw the schematic representation of generator and motor. Explain.
11. A four pole d.c. generator has 384 lap connected conductors, If the flux per pole is 25 mWb, find the induced voltage when the machine is running at 1500 r.p.m.
12. What do you mean by back e.m.f. or counter e.m.f. of D.C. motors ?
13. Distinguish between squirrel cage induction motor and slip ring induction motor.
14. Explain briefly solar power generation.
15. What are the advantages and disadvantages of Tidal energy ?

(10 × 5 = 50 marks)

Turn over

Part B

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

Each question carries 10 marks.

16. (a) (i) State and explain Kirchhoff's law.
- (ii) Two resistance of $10\ \Omega$ and $5\ \Omega$ are connected in series. The series combination is connected across a 30 V d.c. supply. Find the power dissipated in each resistance and the total power drawn from the supply.

Or

- (b) Three resistances R , $2R$ and $3R$ are connected in delta form. Determine the resistance for equivalent star connection.
17. (a) List and explain the comparison between electric and magnetic circuit.

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 0.8 A. Calculate the relative permeability of the core.
18. (a) A resistance of $10\ \Omega$ is connected in series with an inductive reactance of $30\ \Omega$. The series combination is connected across a 230 V, 50 Hz supply. Determine the active power, the reactive power and the power factor.

Or

- (b) Derive the relation between the phase and line values of voltage and current of a three-phase star connected system.
19. (a) Name the various parts of a D.C. motor and explain its construction and working.

Or

- (b) List and explain the properties of an ideal transformer. With a neat diagram explain the principle, construction and operation of an ideal transformer.
20. (a) Sketch the layout of a typical hydroelectric power project. Also mark the positions of reservoir, intake, penstock, surge tank, turbine and generator.

Or

- (b) Draw the line diagram of thermal power station and explain its working. Giving its details.
(5 × 10 = 50 marks)

C 83799

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME]
EXAMINATION, APRIL 2020**

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. Explain briefly NBC.
2. List out the structural components of a residential building.
3. Distinguish between geotechnical and environmental engineering.
4. List out the points to be consider while considering the position and number of doors and windows in 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 principle of chain surveying.
8. Distinguish between Plans and Maps.
9. List the various points to be considered in selecting stations for surveying.
10. What are the different types of cement ?
11. List the properties of good sand.
12. What is meant by seasoning of timber ? Distinguish between natural and artificial seasoning.
13. Distinguish between Flemish bond and English bond in brick masonry.
14. Explain the structural and functional features of roads.
15. With neat sketches explain different types of stone masonry.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any one full section from each question.

Each question carries 10 marks.

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

Or

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

17. (a) Assume a suitable scale and draw the plan and elevation of a simple residential building.

Or

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

18. (a) Write short notes on the following :

(a) Total station ;

(b) Global positioning system.

Or

(b) Explain in detail the principle of theodolite surveying.

19. (a) What are the different types of cement ? Explain the properties and uses ?

Or

(b) What are the different types of steel ?

20. (a) List the points to be considered during stone masonry construction.

Or

(b) With neat sketch explain different types of foundations and requirements for good foundation ?

(5 × 10 = 50 marks)

C 83794

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME]
EXAMINATION, APRIL 2020**

PH 19 100—ENGINEERING PHYSICS

Time : Three Hours

Maximum : 100 Marks

Part A

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

1. Explain the principle and working of interference filter.
2. Fringes of equal thickness are observed in a thin glass wedge of refractive index 1.52. The spacing of the fringes is 1 mm and the wavelength of light used is 580 nm. Calculate the angle of the wedge.
3. Compare prism spectra and grating spectra.
4. Define expectation value in quantum mechanics. Explain its importance.
5. Calculate the quantum number associated with a marble of mass 10 gram trapped to move in a one dimensional box of width 20 cm with speed 1 m/s.
6. Discuss the results of various statistics.
7. The absorption co-efficient of open window is one. Justify the statement.
8. The area of interior surface of an auditorium is 3340 m². Its reverberation time is 1.5 seconds. If average absorption coefficient of interior surface is 0.4 Sabine, find the volume of auditorium.
9. List the different properties of ultrasonic.
10. Briefly explain phase modulated sensors.
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. With block diagram explain intensity modulated sensor.
13. Explain population inversion and metastable level in a laser.
14. Discuss how population inversion achieved in a ruby laser ?
15. Give a qualitative account of BCS theory.

(10 × 5 = 50 marks)

Turn over

Part B

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

Each question carries 10 marks.

16. (a) Describe with necessary theory the experiment to determine the diameter of a thin wire using air wedge. How do you test the plainness of a glass plate by forming an air wedge ?

Or

- (b) What are Polaroid's ? List its application. Briefly explain with suitable example positive and negative crystals.

17. (a) Explain in detail the different operators in quantum mechanics.

Or

- (b) Explain the following :

(i) Fermi level and its significance.

(ii) Microstates and Macrostates.

18. (a) (i) The intensity of sound increased to 100 times. Express it in change in decibels.

(ii) Give the significance of reverberation time.

Or

- (b) Explain the phenomenon of magnetostriction. How will you produce high frequency sound waves with its help ?

19. (a) What is a photodiode ? Give its structure and working. Describe how photodiode can act as a photodetector.

Or

- (b) Explain the following :

(i) Structure and working of LED.

(ii) Thermistors.

20. (a) (i) Explain any five application of optic fibre.

(ii) Outline the principle behind the propagation of light through an Optic fibre.

Or

- (b) What is Josephson junction ? With necessary diagram explain I-V characteristics of a Josephson junction.

(5 × 10 = 50 marks)

C 83796

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME]
EXAMINATION, APRIL 2020**

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) A line AB measures 100 mm. The projectors through its V.T. and the end A are 40 mm apart. The end A is 30 mm above H.P. and 20 mm in front of V.P. The V.T is 10 mm below H.P. Draw the projection of the line and determine H.T. and inclination with H.P. and V.P.

Or

- (b) A square lamina ABCD with 40 mm sides has its corner A in the H.P. Its diagonal AC is inclined at 45° to the H.P. while the diagonal BD is parallel to the H.P. and inclined at 30° to the V.P. Draw its projection.
2. (a) A Hexagonal pyramid, having a base of 30 mm side and a 60 mm long axis, has an edge of its base on the ground and the axis is inclined at 30° to the H.P. The edge of the base on which it rests is inclined at 45° to the V.P. Draw its projection.

Or

- (b) A cone with 60 mm base diameter and 70 mm long axis, rests on its base on HP. It is cut by an A.I.P. passing through the midpoint of the axis such that the true shape of the section is an ellipse of largest major axis. Draw the projection of the truncated cone and the true shape of the section.
3. (a) A square hole with a 45 mm side is cut centrally into a sector with a 135° included angle and 80 mm radius such that one of the diagonals of the hole is on the central radial line of the sector. Draw the projection of the cone obtained by wrapping the sector.

Or

- (b) A triangular prism of base side 45 mm and height 60 mm is placed centrally on the top circular face of the plate of diameter 80 mm and axis 30 mm. The triangular prism is resting on its base with one base edge parallel to V.P. and near to it. The axis of both solids is perpendicular to H. P. Draw the isometric projection of this combination of solids.

(3 × 20 = 60 marks)

Turn over

Part B

Answer any two questions.

4. (a) Draw the perspective view of a square prism having base with a 30 mm side and 60 mm long axis, resting on its rectangular face on G.P. behind P.P with its axis is inclined at 30° with P.P. such that the centre of the nearest base face in the P.P. The station point is 30 mm in front of the PP, 5 mm to the right of the midpoint of the axis and 50 mm above GP.
- (b) Draw neat sketch of Lewis foundation bolt having a diameter 30 mm.
- (c) A cube with 45 mm long edges rests on H.P. with vertical faces equally inclined to the V.P. It is cut by a section plane perpendicular to the V.P. so that the true shape of the section is a regular hexagon. Draw the sectional top view and true shape of the section. Also determine the inclination of the section plane with the H.P.

(2 × 20 = 40 marks)

C 83798

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE
[2019 SCHEME] EXAMINATION, APRIL 2020**

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. 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 of NC 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 $c_p = 1.005 \text{ kJ/kg.K}$, $c_v = 0.718 \text{ kJ/kg.K}$.

Or

- (b) A constant volume chamber of 0.3 m^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 $c_p = 1.968 \text{ kJ/kg.K}$ and $c_v = 1.507 \text{ kJ/kg.K}$.

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)