C 84209 (Pages : 3) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] (SPECIAL) EXAMINATION, APRIL 2020

EN 14 108 (B)—ENGINEERING GRAPHICS (B)

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 midpoint M of a line AB, 50 mm. long and inclined at 40° with HP and 30° with VP is 10mm above HP and on VP. The end A is in the third quadrant and the end B is in the first quadrant. Draw its Projection.

Or

(b) A rectangular plate of size 60 mm. × 40 mm. has one of its shorter edges in VP and inclined at 40° to the HP. Draw its top view if its front view is a square of side 40 mm.

2. (a) A cone of base diameter 50 mm. and axis height 60 mm. is freely suspended from a point on the circumference of its base. Draw its projection when the axis is inclined at 30° with VP.

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 60mm altitude. Draw the sectional top view and true shape of the section.

3. (a) A hopper is to be made of thin sheet. The top and bottom of the hopper are squares of 300 mm and 150 mm. sides respectively and the height is 150 mm. Draw the shape of sheet to be cut to make the hopper.

Or

(b) A waste paper basket is in the form of a frustum of a hexagonal pyramid with base hexagon of 40 mm. side and top hexagon of 60 mm side. Draw the isometric projection if its height is 100 mm.

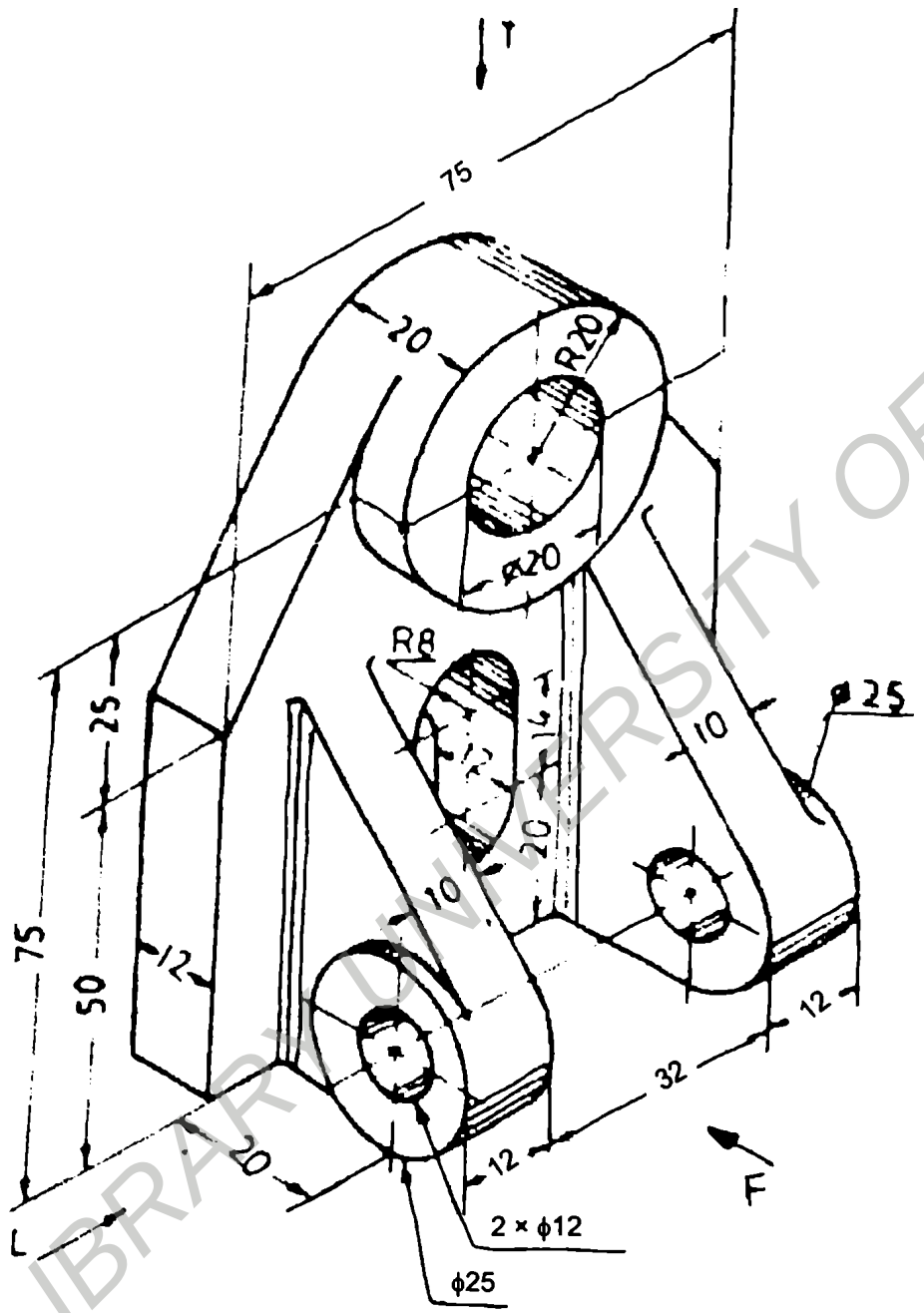
(3 × 20 = 60 marks)

Part B

4. (a) A square prism having a base with a 40 mm. side and 60 mm. 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) Draw the dimensioned orthographic views (all three) of the object shown in figure on (Page 3) :



All dimensions are in mm.

(2 × 20 = 40 marks)

C 84208 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 108 (A)—ENGINEERING GRAPHICS (A)

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 100mm. The projectors through its V.T and the end A are 40mm apart. The end A is 30mm above H.P and 20mm in front of V.P. The V.T is 10mm 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 40mm 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 30mm side and a 60mm 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 60mm base diameter and 70mm 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 45mm side is cut centrally into a sector with a 135° included angle and 80mm 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 45mm and height 60mm is placed centrally on the top circular face of the plate of diameter 80mm and axis 30mm. 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 V.P. Draw the isometric projection of this combination of solids.

(3 × 20 = 60 marks)

Turn over

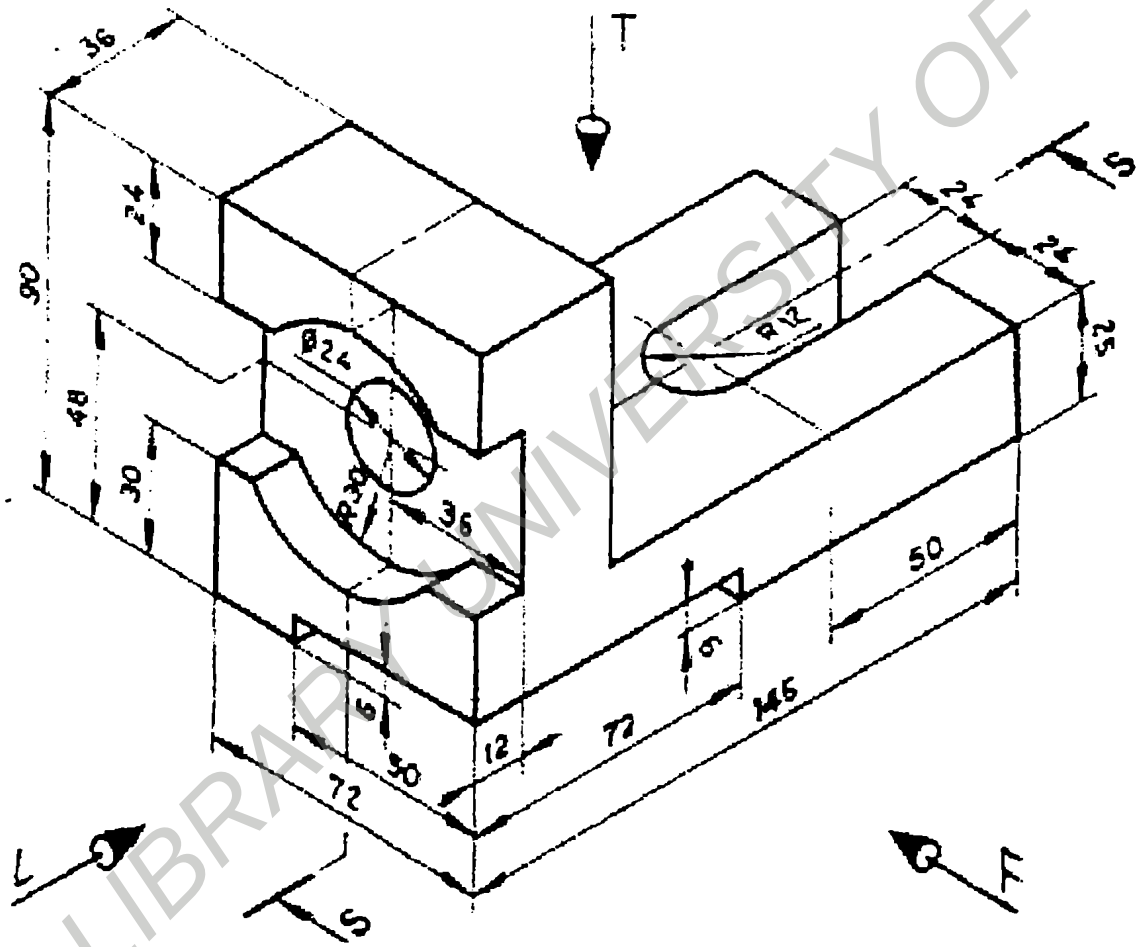
Part B

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 center of the nearest base face in the P.P. The station point is 30mm in front of the PP, 5mm to the right of the midpoint of the axis and 50mm above GP.

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

(c) Draw the dimensioned orthographic views (all three) of the object shown in figure below :



(2 × 20 = 40 marks)

C 84207 (Pages : 3) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 107—BASICS OF ELECTRICAL AND ELECTRONICS AND COMMUNICATION ENGINEERING

Time : Three Hours Maximum : 100 Marks

Section I

Part A

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

1. With a neat diagram, explain unloaded and loaded voltage divider.
2. Discuss the relation between Magnetism and Electricity.
3. Obtain the equation of a 25-Hz current sin wave having rms value of 30 A.
4. Explain briefly the elementary theory of an ideal transformer.
5. List and explain the different application of DC motors.

(4 × 5 = 20 marks)

Part B

Answer any **one** *from each module.*
Each question carries 15 *marks.*

Module I

6. (a) (i) Explain Faraday's laws and Lenz's law. Obtin an expression for coefficient of coupling.

   (ii) A coil of 50 turns having a mean diameter of 73 cm. is placed coaxially at the centre of a solenoid 60 cm. long wound with 2500 turns and carrying a current of 2 A. Find the mutual inductance of this arrangement.

   Or

   (b) (i) What do you mean by resonance in ECR circuit ? Explain it graphically. Derive an expression for Q factor.

   (ii) A coil of power factor 0.6 is in series with a 1001°F capacitor. When connected to a 50 Hz supply, the pd across the coil is equal to pd across the capacitor. Find the resistance and inductance of the coil.

Module II

7. (a) (i) Discuss in detail the different type of DC generators.

(ii) A short-shunt cumulative compound dc generator supplies 7.5 kW at 230 V. The shunt field, series field and armature resistance are 100, 0.3 and 0.4 ohms respectively. Calculate the induced e.m.f. and the load resistance.

Or

(b) (i) With a neat diagram, explain the principle and operation of 3-phase induction motor.

(ii) If a 6-pole motor running from a 50 Hz supply has an e.m.f. in the rotor of frequency 2.5 Hz, determine (a) the slip ; (b) speed of motor.

(2 × 15 = 30 marks)

Section II

Part A

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

1. Draw the circuit diagram of CE amplifier and explain its working.
2. Explain the function of a delay line circuit in the vertical deflection system of a CRO.
3. What is meant by noise ? Write a short account of thermal and shot noise.
4. What is a RADAR ? Write down its equation and explain.
5. What are the advantages of optical communication.

(4 × 5 = 20 marks)

Part B

Answer any **one** *question from each module.*
Each question carries 15 *marks.*

Module I

6. (a) (i) State and explain De Morgan's laws. The NAND and NOR gates are usually referred to as universal gates. Justify this statement with example.

(ii) How would you realise the logic expression :

$$Y = A \oplus B \oplus C \oplus D ?$$

Or

(b) (i) Explain the concept of differential amplifier and oscillators.

(ii) Give the principle of ADC and DAC.

Module II

7. (a) (i) Giving the block diagram of a superheterodyne radio receiver, explain the function of each unit in it.

(ii) Find the carrier and modulating frequencies, the modulation index, and the maximum deviation of the FM wave represented by the voltage equation

$$V = 12\sin(6\times10^{8}t + 5\sin 1250t).$$

What power will this FM wave dissipate in a 10 Ω resistor ?

Or

(b) (i) Explain in detail the mechanism of light cimmunication through optical fibres.

(ii) Discuss how GPRS differs from conventional switching techniques.

(iii) Briefly describe the mobile communication concept and development.

(2 × 15 = 30 marks)

C 84206 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 106—BASICS OF CIVIL AND MECHANICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Section I and Section II are to be answered in **separate** *answer-books.*
Assume suitable data wherever necessary.

Section I (Basics of Civil Engineering)

Part A

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

1. What are the accessories used in chain surveying ?
2. Define workability of concrete.
3. State the objective and requirement of good foundation.
4. How stone masonry is classified ?
5. What are types of columns and explain its uses.

(4 × 5 = 20 marks)

Part B

6. (a) Compare brick masonry and stone masonry.

Or

(b) Describe with neat sketch different types of shallow foundation.

7. (a) Explain the differential levelling with neat sketch.

Or

(b) What are the sources of sand ? State the properties of good sand. What are the functions of sand in mortar ?

(2 × 15 = 30 marks)

Section II (Basics of Mechanical Engineering)

Part A

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

1. Compare MPFI and CRDI engines.
2. What is meant by priming of pumps ?

3. In what ways Kaplan turbine different from Francis turbine ?
4. What is meant by primary shaping process ? Name different types of primary shaping process ?
5. What is energy ? What are different source of energy ?

(4 × 5 = 20 marks)

Part B

6. (a) Explain the working principle of 2 stroke diesel engine with the help of neat sketch.

Or

(b) With the help of neat sketch, explain different types of extrusion process.

7. (a) Explain the working principle of Diesel power plant with neat sketch.

Or

(b) With the help of neat sketches, explain various operations that are carried out in a milling machine.

(2 × 15 = 30 marks)

C 84205 (Pages : 4) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 105—ENGINEERING MECHANICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

Each question carries 5 *marks.*

1. (a) Find the unit vector in the direction of the resultant vector $A = 2\hat{i} - \hat{j} + \hat{k}$, $B = \hat{i} + \hat{j} + 2\hat{k}$, $C = 2\hat{i} + 2\hat{j} + 4\hat{k}$.

   (b) Give a short account of procedure to find resultant of concurrent force system.

   (c) Explain the methods of joints for analysis of trusses.

   (d) State the theorem of Pappus–Guldinus.

   (e) Determine the product of inertia of quarter of a circle about a set of axes passing through base.

   (f) Explain the term angular momentum and torque. Obtain the relation between them.

   (g) The point of application of a force $\vec{F} = 6\hat{i} + 9\hat{j} - 10\hat{k}$ is displaced from the point $\left(\hat{i} + 3\hat{k}\right)$ to the point $\left(2\hat{i} - \hat{j} - 2\hat{k}\right)$. Find the work done by the force.

   (h) Discuss the stability of vehicle moving in curved path.

   (i) State and explain D'Alembert's principle.

   (j) Derive an expression for MI of a rod about an axis normal to its length and through one end.

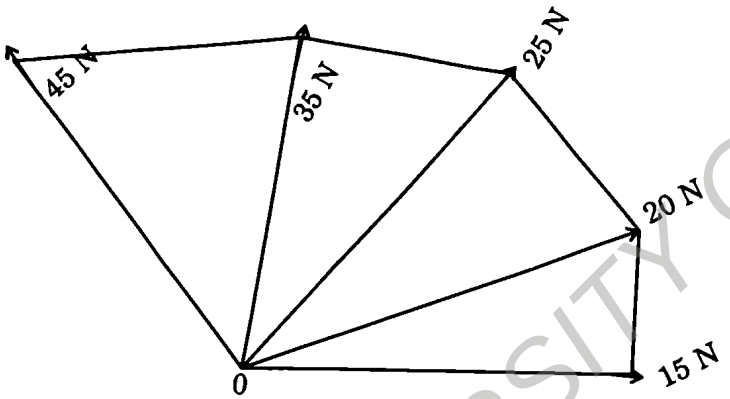
(8 × 5 = 40 marks)

Turn over

Part B

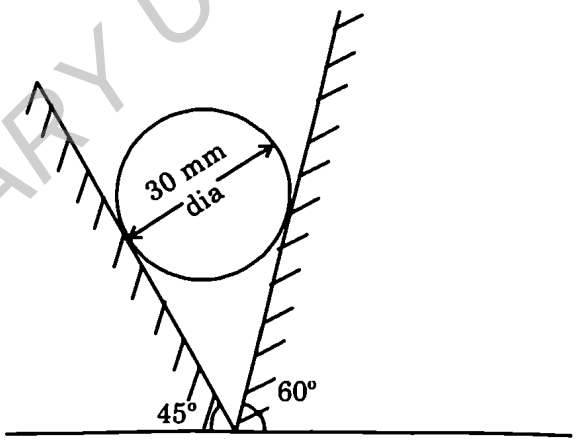
Answer **all** *questions.*
Each question carries 15 *marks.*

2. (a) Forces of 15 N, 20 N, 25 N, 35 N and 45 N act at an angular point of a regular hexagon towards the other angular points as shown in figure. Calculate the magnitude and direction of the resultant force.

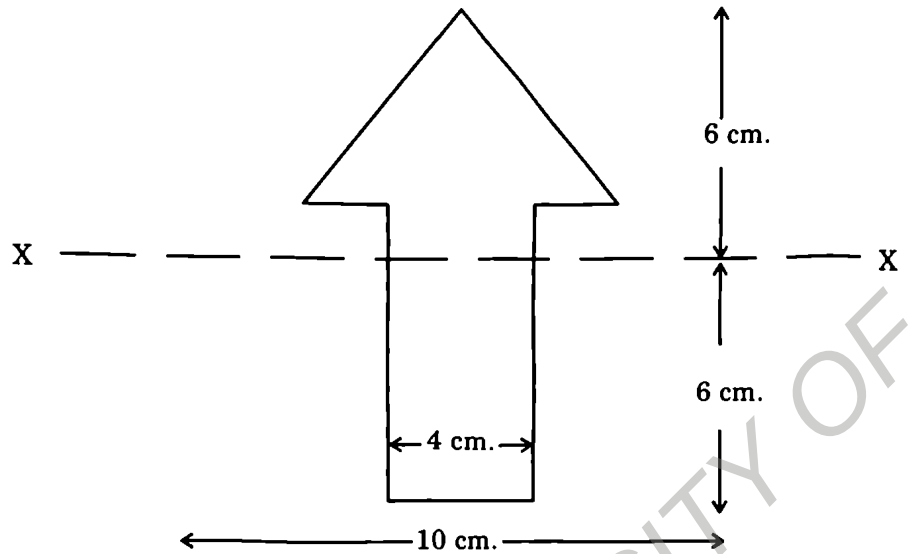


Or

(b) A solid cylinder 30 mm diameter and weighing 30 kg is placed in a triangular channel as shown in figure. Neglecting friction between the contact surface, calculate the normal pressure on the sides of the channel.



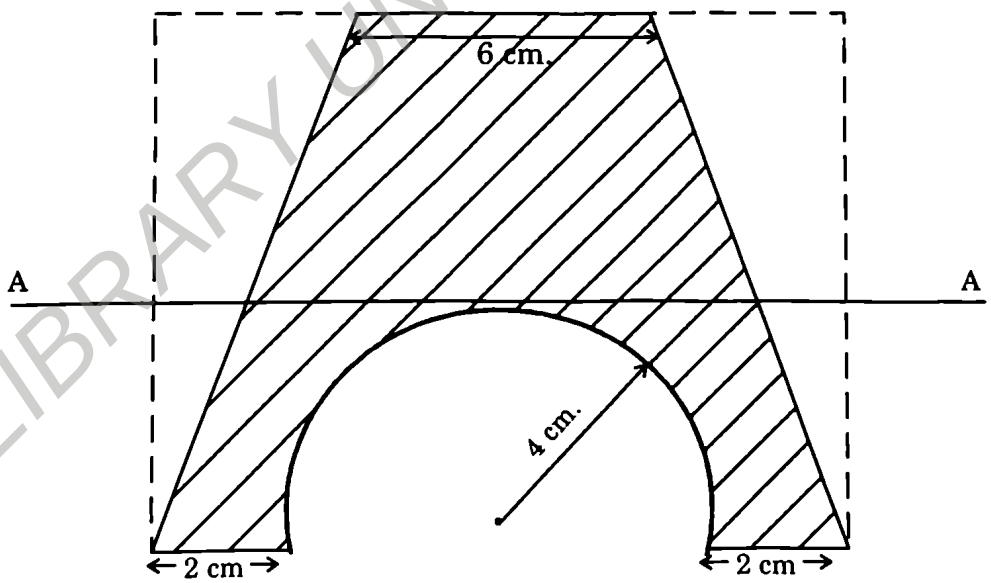
3. (a) Differentiate between Moment of inertia and polar moment of inertia of area. Find the MI of the section below about the axis XX passing through the centroid.



Or

(b) (i) Locate the centroid of a right angled triangular section with height '*h*' and base '*b*' by method of integration.

(ii) Calculate the MI of shaded region about the horizontal axis A A.



4. (a) An elevator of total weight 5000 N starts to move upwards with a constant acceleration of 1 m/s^2. Find the force in the cable during at the floor of the elevator under the fact of a man weighing 600 N when the elevator moves up with a unform retardation of 1 m/s^2.

Or

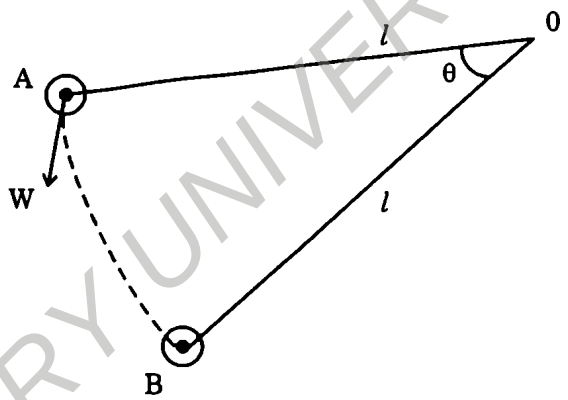
(b) Two weights 80 N and 20 N are connected by a thread and move along a rough horizontal plane under the action of a force of 40 N applied to the wt. 80 N. Coefficient of friction between the sliding surface of the weights and the plane is 0.3. Determine the acceleration of the weights and the tension in the thread using D' Alembert's principle.

5. (a) (i) State and explain work-energy principle for rigid bodies.

(ii) Three bodies, a sphere, a cylinder and a hoop each having the same mass and radius are released from rest from an inclined plane of angle θ. Determine the velocity of each of the bodies after it has rolled down the inclined plane through a distance S.

Or

(b) A simple pendulum is released from rest at A with string horizontal and swings downward. Find the tension T in the string as a function of angle θ as shown in figure.



(4 × 15 = 60 marks)

C 84204 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 104—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain 18 electron rule. Give their importance.
2. What role iron play in Biology ?
3. What is reforming of petrol ? How does it increaes the Octane number ?
4. Discuss the classification of lubricants with examples.
5. Explain the measurement of pH of a solution using glass electrode.
6. Write short note on solar cells.
7. Define (i) Electrode potential ; (ii) Electrochemical cell.
8. Explain how corrosion can be controlled by proper designing.
9. Give an account of tinning and galvanishing.
10. What is meant by sterilisation of water ? Explain how sterilisation of water is carried out by using chlorine and ozone.

(8 × 5 = 40 marks)

Part B

Answer **one** *full question.*
Each question carries 15 *marks.*

Module I

11. (a) Explain the biological role of copper. (7 marks)

    (b) Write short note on metal carbonyls. (8 marks)

Or

12. (a) Describe the application of green chemistry in (i) Pharmaceutical industry ; (ii) environmental protection. (8 marks)

    (b) Discuss any four principles of green Chemistry. (7 marks)

Turn over

Module II

13. (a) What is glass transition temperature ? Discuss the parameters affecting the glass transition temperature. What is its significance ?

(8 marks)

(b) Explain the mechanism of lubrication with diagram. (7 marks)

Or

14. (a) Write short notes on (i) Bulk polymerization ; (ii) Suspension polymerization ; (iii) Emulsion polymeristion.

(8 marks)

(b) What is meant by calorific value of a fuel ? How does gross calorific value differ from net calorific value ? Which of the two for a solid fuel is higher ?

(7 marks)

Module III

15. (a) What is electrochemical series ? Give its applications with suitable examples.

(7 marks)

(b) Derive Nernst equation and give its applications. (8 marks)

Or

16. (a) Explain the construction and working of H_2–O_2 fuel cell. What are its advantages and limitations.

(8 marks)

(b) What is a concentration cell ? Explain with example. (7 marks)

Module IV

17. (a) Discuss the role of nature of oxide formed in oxidation corrosion. State and explain Pilling Bedworth rule.

(8 marks)

(b) Distinguish between Galvanisation and Cementation. (7 marks)

Or

18. (a) What are the constituents of paints ? Illustrate each with two examples. (7 marks)

(b) Describe the estimation of hardness of water by EDTA method. (8 marks)

[4 × 15 = 60 marks]

C 84203 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 103—ENGINEERING PHYSICS

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are coherent source ? How are they realized in practice ?
2. What are non-reflecting films ? Give their applications.
3. Discuss the effect on the diameter of the ring if air is replaced by a liquid in Newton's rings experiment. Give its application.
4. What is a quarter wave plates ? Explain its action on a plane polarized light.
5. Obtain energy and momentum opertors.
6. Explain population inversion and how it is achieved.
7. Explain various types of optical fibre.
8. Show that there is a phase reversal of Π in the output of a CE amplifier.
9. Discuss the variation of Fermi level with temperature.
10. Explain Josephson Effect in superconductivity.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. (a) (i) Give the theory of formation of interference bands in a thin film under reflected system.

(ii) The diameter of 10th 20th Newton's rings formed with a Plano-convex lens and an optically plane glass Oplate are 0.415×10^{-2} m. and 0.616×10^{-2} m. respectively. If the wavelength of the interfering light is 5893 Å, calculate the radius of curvature of the lens.

Or

(b) (i) Describe a method for the determination of the wavelength of a monochromatic radition using Newton's rings.

(ii) Two optically plane glass plates of length 0.1 meter placed one over the other with a thin wire at one end separating the two. The fringes formed with light of wavelength 589.3 nm are of width 3 mm. Calculate the radius of the wire.

12. (a) (i) Describe the construction and working of a nicol prism.

(ii) Calculate the thickness of quartz half wave plate for light of wavelength 6563 Å for which $\mu_e = 1.5508$ and 5893 $\mu_o = 1.5533$.

Or

(b) (i) Obtain an expression for wave function and energy for a particle in one dimensional box.

(ii) Estimate whether an electron can exist inside a nucleus $h = 1.054 \times 10^{-34}$ *vs* and $m = 9.1 \times 10^{-31}$ kg.

13. (a) (i) Explain briefly ruby laser and semiconductor diode laser.

(ii) Define Einstein's coefficients. Derive the relation between coefficients.

Or

(b) (i) With a neat block diagram, explain the basic principle of fibre optic communication.

(ii) What is meant by dispersion loss ? What are the applications of optical fibre.

14. (a) (i) Discuss in detail the constructional features of an LED.

(ii) Explain how the doping of Zener diode differ from normal diode. Describe how Zener diode can act as a voltage stabilizer.

Or

(b) (i) Using a neat diagram, explain how the characteristics of an NPN transistor is studied to evaluate the input resistance, output resistance and current gain.

(ii) Bring out the relation between the current gains α and β.

(4 × 15 = 60 marks)

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 102—ENGINEERING MATHEMATICS—II

Time : Three Hours Maximum : 100 Marks

Part A

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

I. (a) Solve $\tan x \sin^2 y dx + \cos^2 x \cot y \, dy = 0$.

(b) Solve $e^y dx + \left(xe^y + 2y\right)dy = 0$.

(c) Solve $\frac{dy}{dx} = \frac{1}{1+x^2}\left(e^{\tan^{-1}x} - y\right)$.

(d) Find $\mathrm{L}te^{2t}\cos t$.

(e) Find $\mathrm{L}\left(\frac{\cos 6t - \cos 4t}{t}\right)$.

(f) Find $\mathrm{L}^{-1}\left(\frac{1}{2}\log\left(\frac{s^2+b^2}{s^2+a^2}\right)\right)$.

(g) Find the directional derivative of $f(x,y,z) = \frac{z-x}{z+y}$ at p (1, 0, – 3) in the direction of $\bar{a} = -6i + 3j + 2k$.

(h) If $\overline{\mathrm{F}} = \nabla\left(x^3 + y^3 + z^3 - 3xyz\right)$, find $\nabla.\overline{\mathrm{F}}$ and $\nabla \times \overline{\mathrm{F}}$.

(i) Find the total work done in moving a particle in a force field given by $\overline{\mathrm{F}} = 3xyi - 5zj + 10xk$ along the curve $x = t^2 + 1, y = 2t^2, z = t^3$ from $t = 1$ to $t = 2$.

(j) Using Green's theorem evaluate $\int_C \left(3x^2 - 8y^2\right)dx + (4y - 6xy)\,dy$ where C is the boundary of the region defined by $x = 0$, $y = 0$, $x + y = 1$.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

II. A (i) Solve $\left(D^2-2D+1\right)y=e^x\log x$ using the method of variation of parameters.

(ii) Solve $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+2y=x^2+\sin(5\log x)$.

Or

B (i) Solve $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=\cos 2x+x^3+e^{-x}$.

(ii) Find the orthogonal trajectories of $\frac{x^2}{a^2}+\frac{y^2}{a^2+\lambda}=1$, where λ is the parameter.

(1 × 15 = 15 marks)

III. A (i) Using Laplace transform solve $2y''+5y'+2y=e^{-2t}$, $y(0)=y'(0)=1$.

(ii) Evaluate $\int_0^1 x^m\left(1-x^n\right)^p dx$ in terms of Gamma function and hence find $\int_0^1\frac{dx}{\sqrt{1-x^n}}$.

Or

B (i) Find $L^{-1}\left(\frac{2s^2-4}{(s+1)\left(s^2-5s+6\right)}\right)$.

(ii) Using Convolution theorem $L^{-1}\left(\frac{s^2}{s^4-a^4}\right)$.

(1 × 15 = 15 marks)

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

(ii) Show that $\nabla^2 f(r)=f''(r)+\frac{2}{r}f'(r)$ where $\bar{r}=xi+yj+zk$ and $r=|\bar{r}|$.

Or

B (i) Determine the constants a, b, c so that

$$\overline{A} = (x + 2y + az)i + (bx - 3y - z)j + (4x + iy + 2z)k$$

is irrotational. Find also the scalar potential of $\overline{A}$.

(ii) Find the angle between the normals to the surface $xy = z^2$ at the points (1, 4, 2) and (– 3, – 3, 3).

(iii) Find div $\overline{F}$ and curl $\overline{F}$ where $\overline{F} = \nabla(yz + zx + xy)$.

(1 × 15 = 15 marks)

V. A (i) Verify Stoke's theorem for a vector field defined by $\overline{F} = \left(x^2 - y^2\right)i + 2xyj$ in the rectangular region in the XOY plane bounded by the lines $x = 0$, $x = a$, $y = 0$ and $y = b$.

(ii) Evaluate $\int_C \left(2xy - x^2\right)dx + \left(x + y^2\right)dy$ where C is the closed curve of the region bounded by $y = x^2$ and $y^2 = x$.

Or

B Verify the divergence theorem for $\overline{F} = 4xzi - y^2j + yzk$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0$ and $z = 1$.

(1 × 15 = 15 marks)

[4 × 15 = 60 marks]

C 84201 (Pages : 3) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] SPECIAL EXAMINATION, APRIL 2020

EN 14 101—ENGINEERING MATHEMATICS—I

Time : Three Hours Maximum : 100 Marks

Part A

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

I. 1 Find the radius of curvature of $4ay^2 = (2a - x)^3$ at $(a, a/2)$.

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

3 Test the convergence of the series $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \ldots$

4 Prove that the series $\frac{\sin x}{1^3} - \frac{\sin 2x}{2^3} + \frac{\sin 3x}{x^3} - \ldots$ converges absolutely.

5 Test the convergence of the $\frac{1}{3} + \frac{1.2}{3.5} + \frac{1.2.3}{3.5.7} + \ldots$

6 Find the rank of $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$.

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

8 Determine the value of λ so that the equations $2x + y + 2z = 0, x + y + 3z = 0, 4x + 3y + \lambda z = 0$ have a non-zero solution. Find the solution.

9 Find the half range cosine series for $f(x) = \begin{cases} 1, & 0 \le x \le \frac{a}{2} \\ -1, & \frac{a}{2} < x \le a. \end{cases}$

10 Find the half-range sine series for the function $f(x) = \begin{cases} \frac{\pi}{4}x, & 0 < x < \frac{\pi}{2} \\ \frac{\pi}{4}(\pi - x), & \frac{\pi}{2} < x < \pi. \end{cases}$

(8 × 5 = 40 marks)

Turn over

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

II. A (i) Investigate the maximum and minimum values of $z = x^3 + y^3 - 3x - 12y + 20$.

(ii) If $v = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$, prove that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$.

Or

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

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

(1 × 15 = 15 marks)

III. A (i) If $y = \tan^{-1} x$ prove that $\left(1 + x^2\right)y_{n+2} + 2nxy_n + n(n-1)y_{n-1} = 0$. Hence find the Maclaurin's series expansion of $y = \tan^{-1} x$.

(ii) Discuss the convergence of $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{\sqrt{n^2 + 1}} x^n$.

Or

B (i) Find the interval of convergence of $x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \ldots$.

(ii) Prove that $\log(1 + \sin x) = x - \frac{x^2}{2} + \frac{x^3}{6} - \frac{x^4}{12} + \ldots$.

(1 × 15 = 15 marks)

IV. A (i) If $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ find A^{-1} using Cayley-Hamilton theorem.

(ii) Find eigen value and eigen vectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

Or

B (i) Reduce $8x^2+7y^2+3z^2-12xy-8yz+4xz$ into canonical form. Examine for definiteness.

(ii) Prove that eigen values of a unitary matrix are of magnitude unity.

(1 × 15 = 15 marks)

V. A (i) Given $f(x)=\begin{cases}-x+1, & \text{for } -\pi \le x \le 0\\ x+1, & \text{for } 0 \le x \le \pi\end{cases}$. Is the function even or odd ? Find the Fourier series for $f(x)$ and deduce the value of $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$.

(ii) Find the half range sine series of $f(x)=x$ in (0, 2).

Or

B (i) The following table gives the variations of periodic current over a period :

t sec	: 0	T/6	T/3	T/2	2T/3	5T/6	T
A amp	: 1.98	1.30	1.05	1.30	–.88	–.25	1.98

Show that there is a direct current part of 0.75 amp in the variable current and obtain the amplitude of the first harmonic.

(ii) Find the Fourier series expansion of $f(x)=x^2-2$ in $-2<x<2$.

(1 × 15 = 15 marks)

[4 × 15 = 60 marks]

C 84200 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE (SPECIAL) {2009 SCHEME} EXAMINATION, APRIL 2020

EN 09 108 (B)—ENGINEERING GRAPHICS (B)

Time : Three Hours Maximum : 70 Marks

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

Part A

1. (a) Find graphically the length of a largest rod that can be kept inside a hollow cuboid measuring 60 mm × 40 mm × 30 mm.

Or

(b) A pentagonal plane with a 30 mm side rests on the H.P on an edge such that surface is inclined at 45° to the H.P and the edge on which it rests is inclined at 30° to the V.P. Draw its projections.

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 10mm above the H.P.

Or

(b) 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.

3. (a) In a semicircular plate with a 140 mm diameter, a circular hole of largest size is made. The plate is then folded to form a cone. Draw the two views of the cone.

Or

(b) A square prism, having a base on the H.P. It is completely penetrated by another square prism having base with a 40 mm side, such that their axes are 10 mm apart. The axis of the penetrating prism is parallel to both H.P. and V.P. while the faces of both the prisms are equally inclined to the V.P. Draw the projections of the combination and show lines of intersection.

(3 × 14 = 42 marks)

Turn over

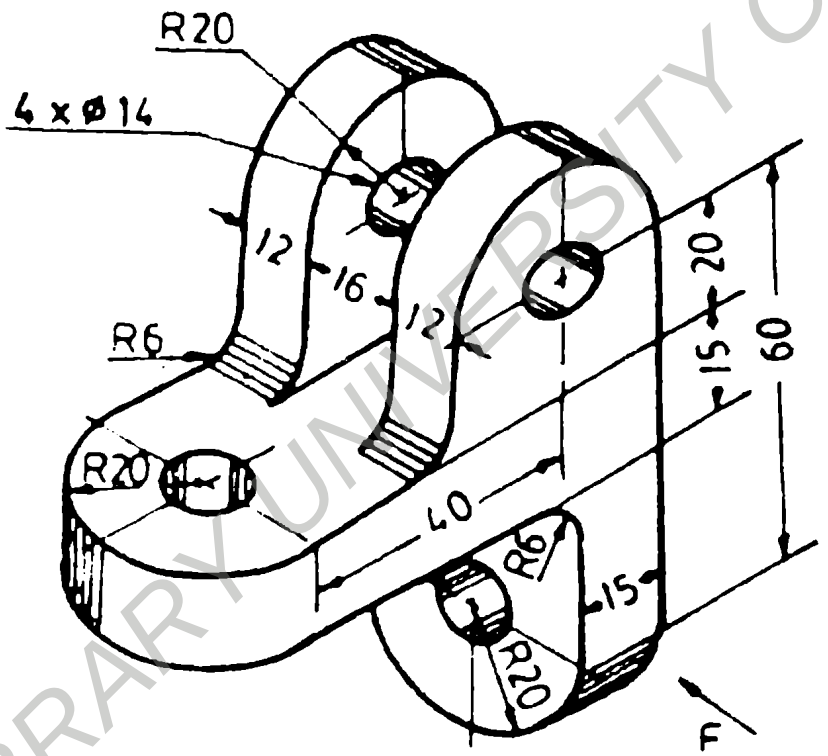
Part B

Answer any **two** *questions.*

4. (a) A square prism having a base with a 40 mm side and 60 mm 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) A hexagonal prism having base with a 30 mm side and 40 mm height is surmounted by a hemi-sphere such that the hemi-sphere is touching all the edges of the top base. Draw the isometric projection of the arrangement.

(c) Draw the dimensioned orthographic views (all three) of the object shown in figure below :



(2 × 14 = 28 marks)

C 84199 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. DEGREE (2009 SCHEME) EXAMINATIONS, APRIL 2020

EN 09 107—BASICS OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING

Time : Three Hours Maximum : 70 Marks

Section 1 [Basics of Electrical Engineering]

Part A

Answer **all** *questions.*

1. Define r.m.s. value, Average value and Form factor. (2 marks)
2. Explain the need for starter in a d.c. motor. (2 marks)
3. Write down the e.m.f. equation of a d.c. generator. (1 mark)

Part B

Answer **two** *questions.*

4. Define active power, reactive power and power factor in a.c. circuits. (5 marks)
5. Explain the types of d.c. motor. (5 marks)
6. Give the constructional details of synchronous generators. (5 marks)

Part C

Answer any **all** *questions.*

7. (a) Define RMS and average values. Also derive the expression for RMS and average values of sine wave. (10 marks)

Or

(b) Explain in detail statically and dynamically induced e.m.f. (10 marks)

8. (a) (i) What is meant by all day efficiency?

(ii) Explain the principle of operation of a transformer.

(4 + 6 = 10 marks)

Or

(b) (i) What are the various parts in a d.c. machine.

(ii) Explain the principle of operation of a d.c. motor.

(5 + 5 = 10 marks)

Turn over

Section 2 [Basics of Electronics and Communication Engineering]

Part A

Answer **all** *questions.*

1. What is CMOS logic? (1 mark)

2. Define voltage gain of amplifier. (2 marks)

3. What is transponder in satellite communication? (2 marks)

Part B

Answer any **two** *questions.*

4. Explain the working principle of ADC. (5 marks)

5. Draw and explain the working of super-hetrodyne receiver. (5 marks)

6. Explain the advantages of optical communication. (5 marks)

Part C

Answer **all** *questions.*

7. (a) Explain the working and Block diagram of CRO. (10 marks)

Or

(b) (i) Explain the effect of negative feed back in amplifiers. (5 marks)

(ii) What is multiplexing? Explain the concept of multiplexing. (5 marks)

8. (a) Explain in detail the principle of satellite communication system. (10 marks)

Or

(b) Explain the following terms :

(i) Frequency reuse.

(ii) Hand off.

(iii) Roaming.

(iv) GSM.

(v) CDMA.

(5 × 2 = 10 marks)

C 84198 (Pages : 3) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [SPECIAL] {2009 SCHEME} EXAMINATION, APRIL 2020

PTEN/EN 09 105—ENGINEERING MECHANICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define the mathematical operations performed in vectors.
2. Find the unit vector in the direction of the resultant of vectors A (2, – 1, 1), B (1, 1, 2) and C (2, 2, 4).
3. State types of trusses.
4. Define Coefficient of friction. Derive a relation for it.
5. Define Kinematics and Kinetics.

(5 × 2 = 10 marks)

Part B

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

6. Define vector multiplication with various cases.
7. Procedure for evaluation of moment of inertia for plane and composite areas.
8. Theorem of Pappus - Guldinus.
9. Condition for equilibrium in a rough inclined plane using FBD.
10. Explain :
    (a) Work.
    (b) Power.
    (c) Energy.
    (d) Impulse.
    (e) Momentum.
11. Write short note on trusses. Define the main methods for truss analysis.

(5 × 4 = 20 marks)

Turn over

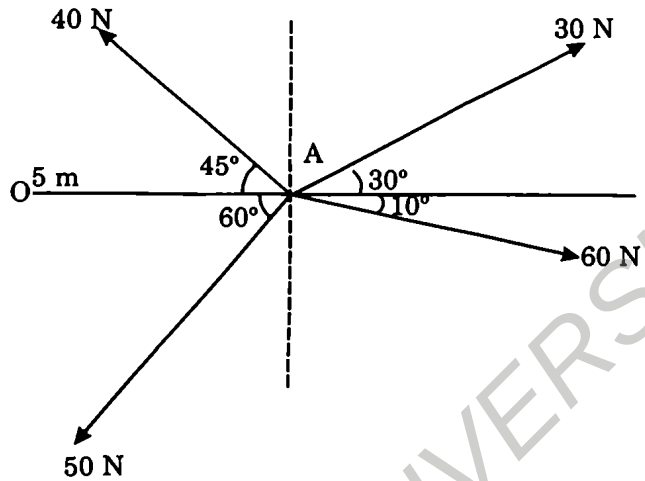
Part C

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

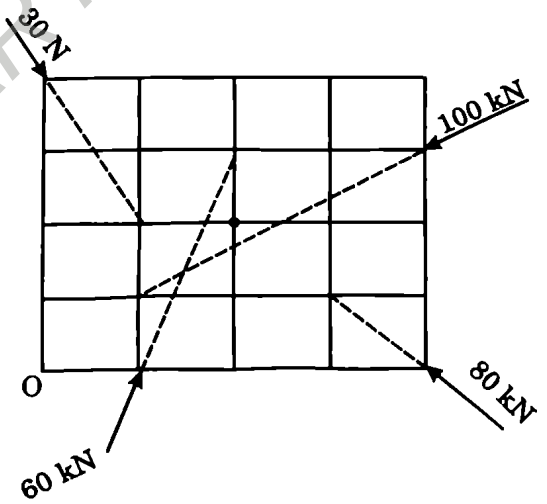
12. (a) Four forces equal to P, 2P, 3P and 4P are acting along four sides of a square ABCD taken in order. Find the characteristics of the resultant.

Or

(b) Calculate the moment of the force system as shown :



13. (a) Determine the resultant of the force system as shown in figure with respect to point O. All squares are unit sqares.

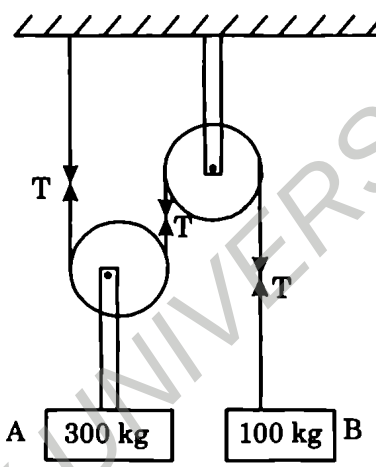


(b) Calculate the MI of a rectangular cross section about the centroidal axes and also about its base.

14. (a) A car enters a curved road in the form of a quarter of a circle, of radius 100 m. at 18 Kmph and leaves at 36 Kmph. If the car is travelling at a constant tangential acceleration, find the magnitude and direction of acceleration when the car (i) Enters ; and (ii) Leaves the curved portion of the road.

Or

(b) Determine the tension in the string and acceleration of the two bodies of mass 300 Kg and 100 Kg connected by a string and a frictionless and weightless pulley as shown in figure.



15. (a) A train of mass 500 tonnes is at a certain instant moving at the rate of 72 Kmph up a gradient of 1 in 120. The resistance due to friction being 65N/tonne. Find the power transmitted by the engine for uniform speed.

Or

(b) Explain the motion of vehicles in curved path with suitable diagram. If the coefficient of friction between the road and tyre of an automobile is 0.2. Then find the speed at which the automobile can travel around a curve of radius 240m without skidding.

(10 × 4 = 40 marks)

C 84197 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. DEGREE (2009 SCHEME) SPECIAL EXAMINATIONS, APRIL 2020

PT EN/EN 09 103—ENGINEERING PHYSICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

Each question carries 2 *marks.*

1. Explain the phenomenon of interference of light.
2. What is double refraction?
3. What is the importance of Zener breakdown voltage?
4. What is photoelectric effect?
5. Write down Sabin's formula.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

6. What is the effect of interference of light in thick films? Explain.
7. How do you test the plainness of glass plate by interference method?
8. A glucose solution of unknown concentration is contained in a 12 cm long tube and seen to rotate linearly polarized light by 2.5°. If the specific rotation of the glucose is 52°+ What is the concentration?
9. Given the numerical aperture to be 0.2441 and the refractive index of the core to be 1.50, calculate the refractive index of the cladding as well as the acceptance angle.
10. An amplifier has a voltage gain of 200, before negative feedback is applied. When negative feedback with $\beta = 0.25$ is applied, the nominal gain changes by 10%. Find the percentage change in the overall gain.
11. Calculate the frequency of the fundamental note of a 4 mm thick quartz crystal. Young's modulus = 9×10^{10} N/m^2 and density of quartz = 2650 kg/m^3.

(4 × 5 = 20 marks)

Part C

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

Each question carries 10 *marks.*

12. (a) (i) Explain Miller indices . Discuss its importance with suitable example.

(ii) Calculate the wavelength of X rays spectrums incident at 15° with the plane for the first order reflection from a calcite crystal with inter atomic spacing of 3.5 Å.

Or

(b) (i) With necessary theory, explain the phenomenon of resolving power of a plane diffraction grating.

(ii) A diffraction grating has 0.15 m of surface ruled with 6×10^5 lines / meter. What is its R.P in the first order?

13. (a) Describe the method of producing linearly polarized light, circularly polarized light and elliptically polarized light. Explain how they can be distinguished from one another.

Or

(b) Explain the construction, principle and use of (i) quarter wave plate and (ii) half wave plate.

14. (a) Explain in detail how semiconductors are classified on the basis of Fermi level and Fermi energy?

Or

(b) Explain in detail about the following :

(i) LED.

(ii) LCD.

(iii) Varacter diode.

15. (a) Write the Schrödinger equation for a particle in a potential well of infinite depth and obtain the solution. Also calculate the energy Eigen values for the ground state and the first excited state in the above case.

Or

(b) List the properties of ultrasonic's. Explain ultrasonic method of non destructive testing of materials.

(4 × 10 = 40 marks)

C 84196 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] SPECIAL EXAMINATION, APRIL 2020

PT EN/EN 09 102—ENGINEERING MATHEMATICS—II

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 marks.

1. Find the solution of $\left(D^2 + 4D + 4\right)y = 0$.
2. Find $L\,t\,e^{-3t}$.
3. Find $L^{-1}\left(\frac{s-2}{s^2+9}\right)$.
4. Find grad ϕ if $\phi(x, y, z) = x^3 - xyz + z^3 - 1$.
5. State Stoke's theorem.

(5 × 2 = 10 marks)

Part B

Answer any **five** *questions.*
Each question carries 4 marks.

6. Solve $(x + 2y)\,dx + (2x + y)\,dy = 0$.
7. Find $L\frac{1-\cos 3t}{t}$.
8. Find $L^{-1}\left(\log\left(\frac{s+a}{s+b}\right)\right)$.
9. Find div$\overline{F}$ and curl $\overline{F}$ at the point (–1, 1, 1) where $\overline{F} = xz^3 i - 3xyzj + 2yz^4 k$.
10. Find a unit vector in the direction in which f increases most rapidly at P, and find the rate of change of f at p in that direction, where $f(x, y, z) = x^3y^2 + yz^3 + z^2 - 1$; $p(1, 1, -1)$.
11. Evaluate by Stoke's theorem $\int_C (e^x dx + 2ydy - dz)$ where C is the circle $x^2 + y^2 = 9, z = 2$.

(5 × 4 = 20 marks)

Turn over

Part C

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

12. (a) Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = \cos 2x + x^3 + e^x$.

Or

(b) Using the method of variation of parameters solve $\left(D^2 + 2D + 1\right)y = e^{-x}\log x$.

13. (a) Using Laplace transforms solve $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 4$ given $y(0) = 2$, $y'(0) = 3$.

Or

(b) Using Convolution theorem find $L^{-1}\left(\frac{s^2}{\left(s^2 + a^2\right)(s^2 + b^2)}\right)$.

14. (a) (i) Show that $\overline{F} = e^x(2y + 3z)i + 2e^x j + 3e^x k$ is irrotational. Find its scalar potential.

(ii) Determine the constants a so that the vector $\overline{F} = (x + 3y)i + (y - 2z)j + (x + az)k$ is solenoidal.

Or

(b) (i) If u and v are scalar point functions and $\overline{F}$ is a vector point function such that $u\overline{F} = \nabla v$, prove that $\overline{F}.\text{curl}\,\overline{F} = 0$.

(ii) If u and v are irrotational, prove that $\overline{u} \times \overline{v}$ is solenoidal.

15. (a) Verify Green's theorem in the plane for $\int_C \left(3x^2 - 8y^2\right)dx + (4y - 6xy)dy$ where C is the boundary of the region defined by $x = 0$, $y = 0$, $x + y = 1$.

Or

(b) Verify divergence theorem for $\overline{F} = x^2 i + 3j + y3k$ taken over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0$ and $z = 1$.

(4 × 10 = 40 marks)

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] SPECIAL EXAMINATION, APRIL 2020

PTEN/EN 09 101—ENGINEERING MATHEMATICS—I

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. If $u = \log\left(\frac{x^2+y^2}{xy}\right)$ find $\frac{\partial^2 u}{\partial x \partial y}$.

2. Discuss the convergence of the series, $\sum_{n=1}^{\infty} \frac{1}{n^n}$.

3. Find the rank of the matrix $\begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$.

4. Find a_n in the half range cosine series expansion of $f(x) = \{x, 0 \le x \le \pi\}$.

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

(5 × 2 = 10 marks)

Part B

Answer any **five** *questions.*
Each question carries 4 *marks.*

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

7. If $u = \sec^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2\cot u$.

8. Discuss the convergence of $\frac{x}{1+x} + \frac{x^2}{1+x^2} + \frac{x^3}{1+x^3} + \ldots$.

9. For what values of λ and μ do the system of equations $x + y + z = 6, x + 2y + 3z = 10$ $x + 2y + \lambda z = \mu$ have (a) no solution ; (b) unique solution ; and (c) more than one solution.

10. Find the half range sine series for $f(x)=\begin{cases}\frac{1}{4}-x, & 0<x<\frac{1}{2}\\ x-\frac{3}{4}, & \frac{1}{2}<x<1.\end{cases}$

11. Find the Fourier series expansion of $f(x)=x^2$ in $-l\le x\le l$.

(5 × 4 = 20 marks)

Part C

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

12. Prove that the evolute of the tractrix $x=a(\cos t+\log\tan t/2),\ y=a\sin t$ is the catenary $y=a\cosh(x/a)$.

Or

Find the maxima and minima of $x^3y^2(12-x-y)$ if $x>0,\ y>0$.

13. Discuss the convergence of $\frac{1}{3}x+\frac{1.2}{3.5}x^2+\frac{1.2.3.}{3.5.7}x^3+\ldots(x>0)$.

Or

If $y=\sin^{-1}x$ prove that $\left(1-x^2\right)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$. Using it obtain the Maclaurin's series expansion of $\sin^{-1}x$.

14. Obtain an orthogonal transformation which will transform the quadratic form $6x^2+3y^2+3z^2-4xy-2yz+4xz$ to canonical form and find the reduced form.

Or

Diagonalise $\mathrm{A}=\begin{bmatrix}1 & 6 & 1\\ 1 & 2 & 1\\ 0 & 0 & 3\end{bmatrix}$.

15. Find the Fourier series of $f(x)=x+x^2,-\pi<x<\pi$, given that $f(x)$ is periodic with period 2π. Using the series deduce that $\frac{\pi^2}{12}=1-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots.$

Or

Analyse harmonically the data given below and express y in Fourier series upto the third harmonic :

x :	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y :	1.0	1.4	1.9	1.7	1.5	1.2	1.0

(4 × 10 = 40 marks)

C 81384-B (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

EN 09 106—BASICS OF CIVIL AND MECHANICAL ENGINEERING

Time : Three Hours Maximum : 70 Marks

Section I and Section II are to be answered in **separate** *answer books.*

Section I (Basics of Civil Engineering)

PART A

Answer **all** *questions.*

1. Distinguish between ordinary steel and torsteel.

(2 marks)

2. What is brick masonry and stone masonry ?

(2 marks)

3. What is Chain surveying ?

(1 mark)

PART B

Answer any **two** *questions.*

4. Explain the differential levelling with neat sketch.
5. Compare brick masonry and stone masonry.
6. What are the different types of cement ?

(2 × 5 = 10 marks)

PART C

Answer any **one** *full question.*

7. a) Explain different types of bonds used in brick masonry.
   b) List out the instruments used for surveying and explain the principle of dumpy level ?
8. a) What are different types of foundations and its functions ?
   b) Explain about the materials used in construction.

(1 × 20 = 20 marks)

Turn over

Section II (Basics of Mechanical Engineering)

Part A

Answer **all** *questions.*

1. Define the terms Compression ratio and Stroke.

(2 marks)

2. What is meant by Priming of Pumps ?

(2 marks)

3. What are the different modes of power transmission ?

(1 mark)

Part B

Answer any **two** *questions.*

4. What is the concept of MPFI ?
5. Explain the working principle of gas turbine power plant.
6. Explain closed die forging process with the help of neat sketch.

(2 × 5 = 10 marks)

Part C

Answer any **one** *full question.*

7. a) Explain the working principle of 4 stroke diesel engine with the help of neat sketch.
   b) With the help of neat sketch explain different types of extrusion process.

Or

8. a) What is the principle of working of geothermal power plant ?
   b) With the help of neat sketch explain the working principle of jet pump and its application ?

(1 × 20 = 20 marks)

C 81384-A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

PTEN 09 106—HUMANITIES AND COMMUNICATION SKILLS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Indias achievements in space technology.
2. Inter personal communication.
3. Note making.
4. Need of writing a rough draft.
5. Moral dilemma.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Describe the features of Indus Valley Civilization.
7. Discuss the various moral issues involved in Engineering profession.
8. Explain the role of a team leader in Group Discussion.
9. Describe the methods of reading comprehension.
10. Briefly discuss the importance of technical communication.
11. Examine the role of body language in group discussion.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. (a) Describe the causes and effects of Industrial Revolution.

Or

(b) Explain the importance of skimming and scanning in reading comprehension.

13. (a) Explain the terms body language and feed back. Write a note on their importance in communication.

Or

(b) Describe the major achievements made by India in the field of communication and space technology.

Turn over

14. (a) While summerising a passage for official purpose. What points will you keep in mind to make the summary more effective ?

Or

(b) Discuss the various moral issues involved in Engineering profession citing suitable examples.

15. (a) Write down the various steps to be followed in the preparation of a project report.

Or

(b) Write a letter of complaint to a dealer who has supplied defective computers in response to your order for the same.

(4 × 10 = 40 marks)

C 81383-E (Pages : 3) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

EN/PTEN 09 105—ENGINEERING MECHANICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Find the unit vector in the direction of the resultant of vectors A (2, – 1, 1), B (1, 1, 2) and C (2, 2, 4).
2. Define :
   (a) Rectilinear Motion.
   (b) Curvilinear Motion.
3. Derive the minimum force required to keep a block of wood from falling down a vertical wall.
4. What is the function of unit vector ?
5. What do you mean by static indeterminacy ?

(5 × 2 = 10 marks)

Part B

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

6. What is the relation connecting angle of friction and angle of repose ?
7. Comment on the concept of virtual work.
8. Describe the conditions for equilibrium of coplanar concurrent and non-concurrent force systems.
9. State and explain parallel axis theorem.
10. What is Lami's theorem ? Explain its significance.
11. State using the concept of FBD, represent the motion of a person in a lift (2 cases).

(4 × 5 = 20 marks)

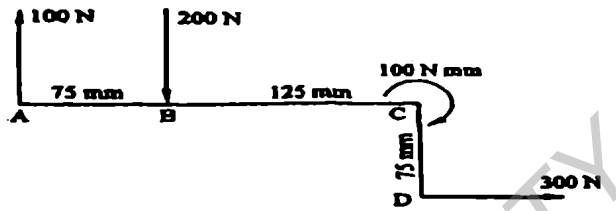
Turn over

Part C

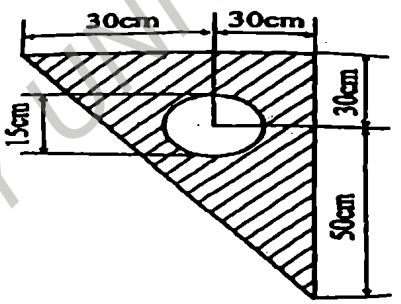
Answer section (a) **or** *section (b).*
Each question carries 10 *marks.*

12. (a) Three forces 200 N, 300 N and 400 N act along the three sides of an equilateral triangle taken in order. Find the magnitude and line of action of the resultant force.

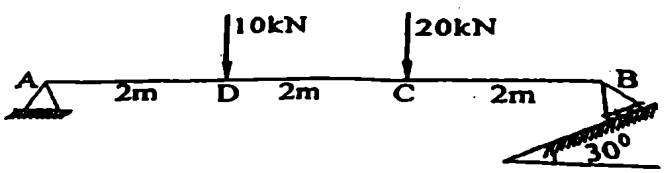
(b) Find the resultant of the system of forces shown in figure and the point of intersection of its line of action with (i) Line AC ; and (ii) Line CD.



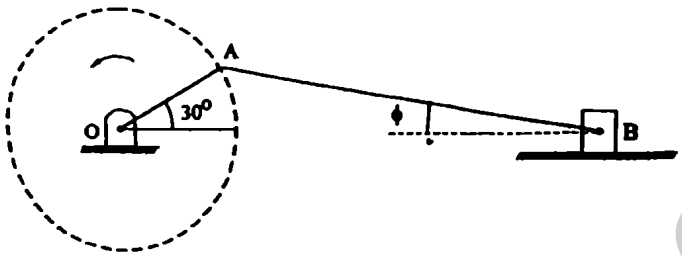
13. (a) Calculate the moment of inertia of the shaded area as shown in figure, with respect to the centroidal axes.



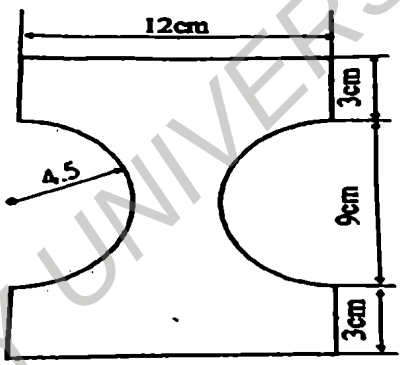
(b) A beam 6 m long is loaded as shown in figure. Calculate the reactions at supports A and B.



14. (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 road are 120 mm and 500 mm 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.



(b) Find the moment of inertia of the cross-section of an iron beam as shown in figure with respect to the centroidal axes.



15. (a) A vehicle of mass 120 kg is to turn a level circular curve of radius 100 metres with a velocity of 30 kmph. The height of its C.G. above the road level is 1m and the distance between the centre lines of the wheel is 1.5 m. Find the reactions on the wheels.

(b) Hailstones fall vertically at a velocity of 4m/s on to the deck of a ship steaming at 8m/s. Find the direction of motion of a hailstone as felt by an observer on the deck and its apparent velocity.

(4 × 10 = 40 marks)

C 81383–D (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

EN/PTEN 09 104—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What are liquid crystals ?
2. Give any *two* applications of carbon nanotubes.
3. Define flash point.
4. What is e.m.f. of a cell ?
5. Give an example for stress corrosion.

(5 × 2 = 10 marks)

Part B

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

6. Discuss the electrical conductivity of solids based on band theory.
7. Explain any *two* polymerization techniques.
8. What is meant by single electrode potential ? How is it measured ?
9. Find the e.m.f. of the cell $Mg_{(s)}/Mg^{2+}{}_{(aq)}//Cd^{2+}{}_{(aq)}/Cd_{(s)}$ at 25°C if $[Cd^{2+}] = 6 \times 10^{-11}$ M and $[Mg^{2+}] = 1M$. E° cell = 1.97 V.
10. What is cementation ? How is it done ?
11. Classify the air pollutants. What are their sources ?

(4 × 5 = 20 marks)

Part C

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

12. (a) What are intrinsic semiconductors? Explain the conduction in *n*-type and *p*-type semiconductors.

Or

(b) With a neat diagram describe ion-exchange process for demineralization of water.

Turn over

13. (a) Write the structures , two properties and two uses of (i) PE ; (ii) Nylon-6 ; (iii) Bakelite ; (iv) PVC ; and (v) PVA.

Or

(b) Discuss the mechanism of lubrication with neat diagram.

14. (a) Derive Nernst equation for single electrode potential and explain the terms involved in it. Write its applications.

Or

(b) Define fuel-cell. Explain the construction and working of $H_2 - O_2$ fuel cell. What are the advantages and limitations ?

15. (a) Describe the different types of corrosion and discuss any *five* factors that affect corrosion.

Or

(b) Write short notes on : (i) Ozone depletion ; (ii) Alternate refrigerants ; and (iii) CFC dissociation and its reaction with ozone.

(4 × 10 = 40 marks)

C 81383–C (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

EN/PTEN 09 103—ENGINEERING PHYSICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Extremely thin films viewed in white light appear dark. Why ?
2. What do you mean by optical path ?
3. Distinguish between positive crystal and negative crystal.
4. What is law of mass action ?
5. Give any *two* properties of ultrasonics.

(5 × 2 = 10 marks)

Part B

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

6. Distinguish between Fresnel and Fraunhofer class of diffraction.
7. What is miller indices ? Give its importance in the study of crystal structure.
8. Discuss the application of laser in medicine.
9. Discuss the working of a transistor as an amplifier.
10. Briefly explain avalanche break down and Zener break down.
11. Give a brief idea of the future prospects of nanotechnology.

(4 × 5 = 20 marks)

Part C'

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

12. (a) Describe the structure of NaCl crystal.

Or

(b) Obtain an expression for the resolving power of a plane transmission gratings.

13. (a) What is specific rotatory power ? Describe Laurent's half shade polary meter method of determining the specific rotation of sugar solution.

Or

(b) Explain the basic technique of holography. Describe how a hologram is prepared and viewed.

14. (a) What is a tunnel diode ? Describe its construction and uses. Explain the principle of working of a tunnel diode, giving its characteristics.

Or

(b) Explain in detail about the following :

(i) Flux quantisation.

(ii) SQUID.

(iii) Applications of superconductivity.

15. (a) Give brief ideas of black body radiation and photoelectric effect. Explain the two forms of uncertainty principle.

Or

(b) Set up the time dependent Schrödinger equation for a free particle and obtain its solution. Give a short note on 'particle in a box'.

(4 × 10 = 40 marks)

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

EN/PTEN 09 102—ENGINEERING MATHEMATICS – II

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Find the complementary function of $\left(D^2+4\right)y=e^{-2x}$.

2. Find $Le^t t$.

3. Find $L^{-1}\left(\frac{1}{s^2+2s+2}\right)$.

4. If $\phi(x,y,z)=3x^2y-y^3z^2$ find grand ϕ.

5. State Stoke's theorem.

(5 × 2 = 10 marks)

Part B

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

6. Solve $\frac{dy}{dx}=e^{2x-y}+x^3e^{-y}$.

7. Find $Lt\, e^{-3t}\sin 5t$.

8. Find $L\left(\frac{e^{-at}-e^{-bt}}{t}\right)$.

9. Find the directional derivative of $f(x,y,z)=x^2y^2z-yx^2z+z^3$ at $p(2,-1,1)$ in the direction of $\bar{a}=5i-j+2k$.

10. Find the work done by the force $\bar{F} = xi + yj$ when it moves a particle on the curve $2y = x^2$ from $(0,0)$ to $(2,2)$.

11. Evaluate by Stoke's theorem $\int_C yzdx + zxdy + xydz$ where C is the curve $x^2 + y^2 = 1, y^2 = z$.

$(4 \times 5 = 20$ marks)

Part C

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

12. (a) Using the method of variation of parameters solve :

$$\left(D^2 - 2D + 2\right)y = e^x \tan x.$$

Or

(b) Solve $(D-2)^2 y = 8\left(e^{2x} + \sin 2x + x^2\right)$.

13. (a) Solve the differential equation by using Laplace transform $\frac{d^2y}{dt^2} - \frac{3dy}{dt} + 2y = 4$, given $y(0) = 2$ and $y'(0) = 3$.

Or

(b) Using convolution theorem find $L^{-1}\left(\frac{s^2}{\left(s^2+4\right)^2}\right)$.

14. (a) If $\bar{r} = xi + yj + zk$ and $r = |\bar{r}|$ then prove the following :

(i) $\nabla r^n = nr^{n-2}\bar{r}$.

(ii) $\nabla^2 r^n = n(n+1)r^{n-2}$.

(iii) $\text{div}\left(\frac{\bar{r}}{r^3}\right) = 0$.

Or

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

15. (a) Verify Green's theorem in a plane with respect to $\int_C x^2dx - xydy$ where C is the boundary of the square formed by $x = 0, y = 0, x = a, y = a$.

Or

(b) Verify divergence theorem for $\bar{F} = \left(x^3 - yz\right)i - 2x^2yj + 2k$ taken over the cube bounded by the planes $x = 0, x = a, y = 0, y = a, z = 0, z = a$.

(4 × 10 = 40 marks)

C 81383-A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [09 SCHEME] EXAMINATION, APRIL 2020

PTEN/EN 09 101—ENGINEERING MATHEMATICS — I

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Evaluate $\lim_{x \to 0} \frac{\tan x - x}{x^2}$.

2. If $u = e^x \sin y$ and $v = x + \log \sin y$, find the Jacobian.

3. Discuss the convergence of the series $1 - \frac{2}{3} + \frac{3}{5} - \frac{4}{7} + \ldots$

4. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$.

5. Find the half range sine series of $f(x) = k$ in $0 < x < \pi$.

(5 × 2 = 10 marks)

Part B

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

6. Find the radius of curvature at $\left(\frac{\pi}{4}, 1\right)$ on the curve $y = \tan x$.

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. Test for convergence of the series $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots$

9. Solve the following system $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

Turn over

10. Expand $f(x) = x^3$ in $-\pi < x < \pi$ in a Fourier series.

11. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$.

(4 × 5 = 20 marks)

Part C

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

12. (a) Investigate the maximum and minimum values :

$$z = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x.$$

Or

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

13. (a) Discuss the convergence of $\frac{4}{7}x + \frac{7}{11}x^2 + \frac{10}{15}x^3 + \ldots$

Or

(b) Discuss the convergence of the series :

(i) $\sum_{n=1}^{\infty} \left(\sqrt{n^4+1} - \sqrt{n^4-1}\right)$. (ii) $\sum_{n=1}^{\infty} \frac{n}{1+2^n}$.

14. (a) Find the eigen values and eigen vectors of the matrix :

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$

Or

(b) Reduce the quadratic form $x^2 - 2xy + y^2 + z^2$ into Canonical form. Examine for definiteness.

15. (a) Find the Fourier series expansion of :

$$f(x) = \begin{cases} x, & 0 \le x \le x \\ 2\pi - x, & \pi \le x \le 2\pi. \end{cases}$$

Or

(b) Analyse harmonically the data given below and express y in Fourier series upto the third harmonic :

x	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y	1.0	1.4	1.9	1.7	1.5	1.2	1.0

(4 × 10 = 40 marks)

D 40849–A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

EN 09 108 (B)—ENGINEERING GRAPHICS (B)

Time : Three Hours Maximum : 70 Marks

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

Part A

1. (a) An electric lamp is hung vertically from the centre of the roof of a room 4 m. × 5 m. and height 4 m. at a height of 3 m. above the floor. Find graphically the distance between the lamp and any one of the corner below.

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) (b) A cone, with a 60 mm. base diameter and a70 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 appoint on the axis, 20 mm. above the base. Draw its sectional top view and obtain true shape of the section.

3. (a) A pentagonal pyramid side of base 20 mm. and axis height 45 mm. is kept with its base on H.P. One of the base edges is parallel to V.P. A string is taken around the pyramid from the extreme base corner back to the same point. Obtain the shortest length of string required and show its position in the plan and elevation of the pyramid.

Or

(b) A cylinder with a 70 mm. base diameter is resting on its base on the H.P. It is penetrated by another cylinder with a 50 mm. base diameter, the axis of which is parallel to both the principal planes. The two axes are 14 mm. apart. Draw the projections of the combination and show the curves of intersection.

(3 × 14 = 42 marks)

Turn over

Part B

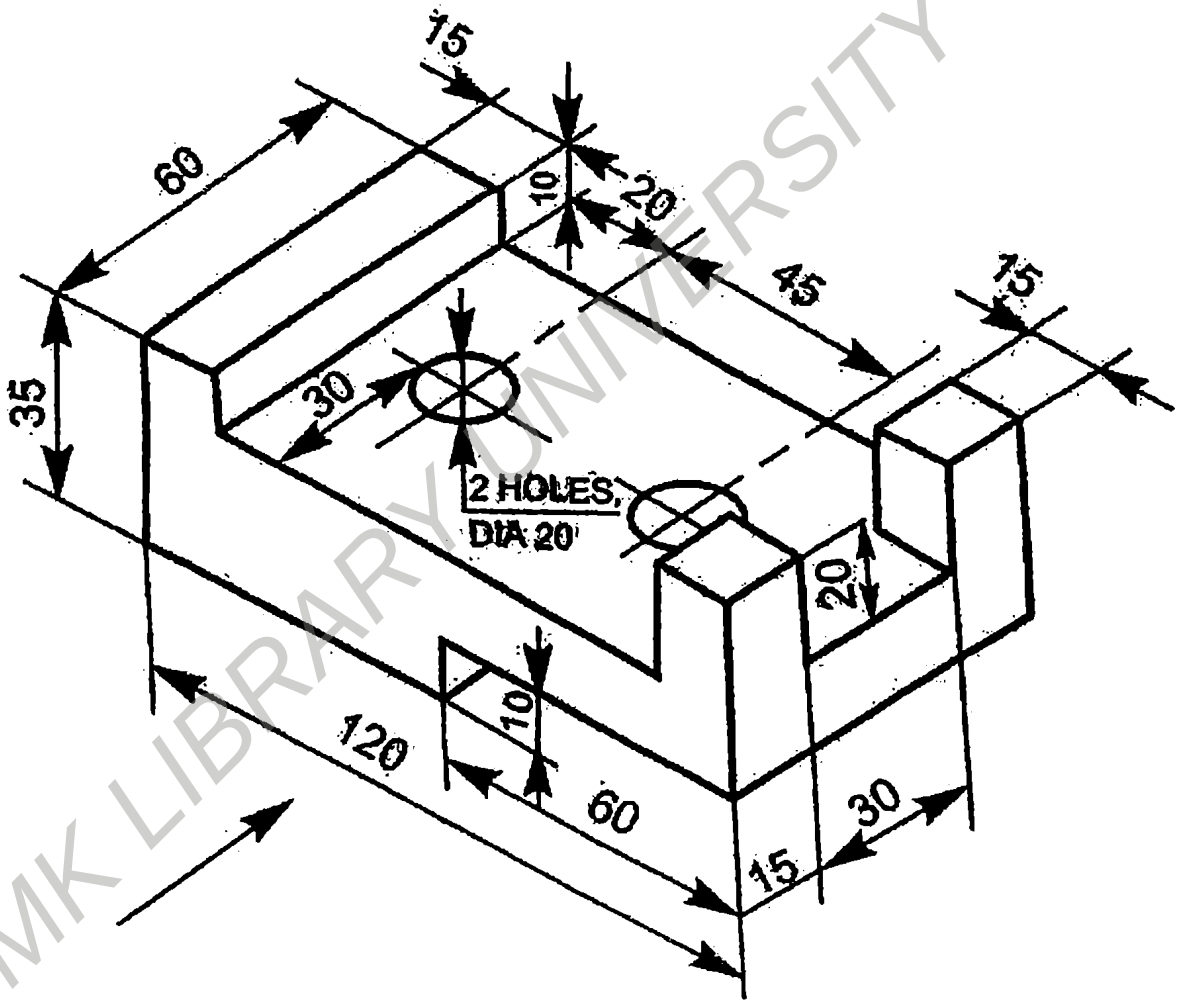
Answer any **two** *questions.*
Each question carries 14 *marks.*

4. (a) Draw the perspective view of a square prism having base with a 40 mm side and 60 mm long axis, resting on its base in the G.P. with its axis that is 40 mm behind the P.P. and a vertical face right to the axis inclined at 60° to it. The station point is 50 mm in front of PP, 90mm above G.P and lies in a C.P. which is 50 mm. towards right of the axis.

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 V.P. Draw the isometric projection of this combination of solids.

(c) Draw the dimensioned orthographic views (all three) of the object shown in figure below :



All Dimensions are in mm.

(2 × 14 = 28 marks)

D 40848-A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

EN 09 108 (A)—ENGINEERING GRAPHICS (A)

Time : Three Hours Maximum : 70 Marks

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

Part A

1. (a) An electric lamp is hung vertically from the centre of the roof of a room 4m × 5m and height 4m at a height of 3 m above the floor. Find graphically the distance between the lamp and any one of the corner below.

Or

(b) A Hexagonal plane with a 30mm 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 50mm 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 10mm above the H.P.

Or

(b) A tetrahedron, with 60mm long edges, is lying on the H.P on one of its faces with an edge perpendicular to the V.P. It is cut by an A.I.P so that the true shape of section is an isosceles triangle with a 30 mm base and a 40mm altitude. Find the inclination of the section with the H.P and draw the front view, sectional top view and true shape of the section.

3. (a) In a semicircular plate with a 140mm diameter, a circular hole of largest size is made. The plate is then folded to form a cone. Draw the two views of the cone.

Or

(b) A square prism, having a base on the H.P. It is completely penetrated by another square prism having base with a 40mm side, such that their axes are 10mm apart. The axis of the penetrating prism is parallel to both H.P. and V.P, while the faces of both the prisms are equally inclined to the V.P. Draw the projections of the combination and show lines of intersection.

(3 × 14 = 42 marks)

Turn over

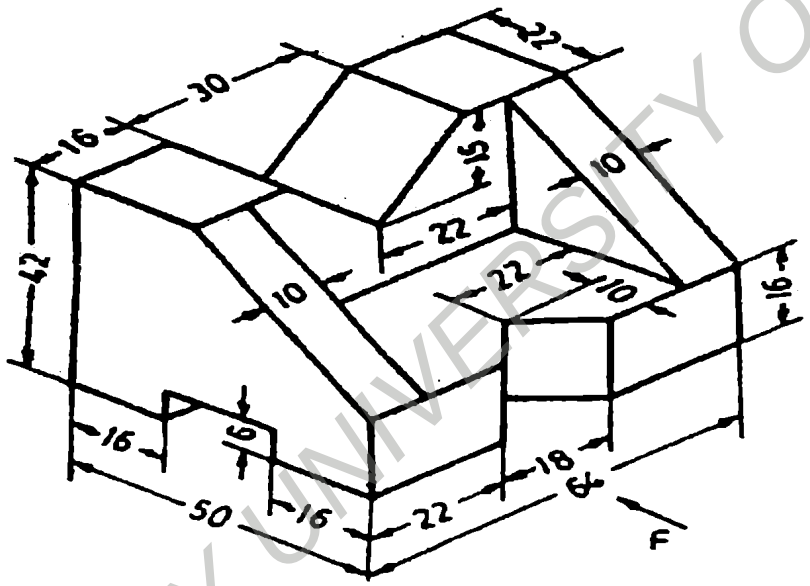
Part B

Answer any **two** *questions.*

4. (a) Draw the perspective view of a square prism having base with a 40 mm side and 60 mm long axis, resting on its base in the G.P with its axis that is 40 mm behind the P.P and a vertical face right to the axis inclined at 60° to it. The station point is 50 mm in front of PP, 90mm above G.P and lies in a C.P which is 50mm towards right of the axis.

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

(c) Draw the dimensioned orthographic views (all three) of the object shown in figure below :



(2 × 14 = 28 marks)

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

EN 09 107—BASICS OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING

Time : Three Hours Maximum : 70 Marks

Section I (Basics of Electrical Engineering)

Part A

Answer **all** *questions.*

1. Explain the voltage divider circuit. (2 marks)
2. Explain Fleming's left hand rule. (1 mark)
3. What is the significance of back emf ? (2 marks)

Part B

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

4. Explain active power, reactive power and apparent power of an ac circuit.
5. With diagram explain neutral current in Y connected system.
6. With a diagram explain series wound dc generator.

(2 × 5 = 10 marks)

Part C

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

7. (a) (i) Discuss the theory of AC through series LCR circuit.

(ii) A resistor of 50 ohm and a capacitor of 100 μF are connected in series across a 100 V, 50 Hz supply. Find the impedance, current, power factor, voltage across the resistor and voltage across the capacitor.

Or

(b) (i) Distinguish between resonance in series LCR circuit and parallel LCR circuit.

(ii) Discuss in detail the power in star connected system.

Turn over

8. (a) (i) With a neat diagram explain the principle and operation of a transformer.

(ii) Discuss with theory the AC through a purely inductive circuit.

Or

(b) (i) Compare the properties of squirrel cage induction motor and slip ring induction motor.

(ii) How does the variation of supply frequency affect the operation of induction motor ?

(2 × 10 = 20 marks)

SECTION II (BASICS OF ELECTRONICS AND COMMUNICATION ENGINEERING)

Part A

Answer **all** *questions.*

9. Give the principle of amplifiers. (2 marks)

10. Distinguish between amplifier and oscillator. (1 mark)

11. What is the principle of Radar ? (2 marks)

Part B

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

12. Discuss the effect of negative feedback.

13. Give the principle of digital voltmeter.

14. Briefly explain the concept of cells.

(2 × 5 = 10 marks)

Part C

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

15. (a) With suitable example explain the implementation of logic circuits using universal gates.

Or

(b) Draw a simple TTL inverter circuit and explain its operation. Explain how it can be modified into a NAND gate.

16. (a) Draw the block diagram of AM transmitter and FM transmitter. Explain the function of each block.

Or

(b) Explain the civilian and military applications of RADAR.

(2 × 10 = 20 marks)

D 40845–A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

EN 09 106—BASICS OF CIVIL AND MECHANICAL ENGINEERING

Time : Three Hours Maximum : 70 Marks

Section I and Section II are to be answered in **separate** *answer books.*

Section I (Basics of Civil Engineering)

PART A

Answer **all** *questions.*

1. State the various properties of good cement. (2 marks)
2. What is surveying ? (2 marks)
3. What is the function of a beam ? (1 mark)

PART B

Answer any **two** *questions.*

4. Explain the principle of chain surveying.
5. Compare brick masonry and stone masonry.
6. What are the different types of cement ?

(2 × 5 = 10 marks)

PART C

Answer any **one** *full question.*

7. (a) Define beam, column and Lintel.
   (b) What are the different types of steel ?
8. (a) Explain the principle of theodolite surveying.
   (b) State the properties and application of cement concrete.

(1 × 20 = 20 marks)

Section II (Basics of Mechanical Engineering)

PART A

Answer **all** *questions.*

1. Differentiate heat and work ? (2 marks)
2. Define welding ? (2 marks)
3. Write the expression for power transmission and belt tension for belt drives. (1 mark)

Turn over

Part B

Answer any **two** *questions.*

4. State the difference between 2 stroke and 4 stroke engines ?
5. Explain the principle of steam power plant.
6. Classify hydraulic turbines and pumps.

(2 × 5 = 10 marks)

Part C

Answer any **one** *full question.*

7. (a) Explain the working principle of Diesel power plant with the help of neat sketch.

   (b) Explain the working principle of centrifugal pump.

Or

8. (a) Explain wind and tidal power plant ?

   (b) Explain different types of forging process with neat sketches.

(1 × 20 = 20 marks)

D 40843–A (Pages : 4) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2018

PTEN/EN 09 105—ENGINEERING MECHANICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What do you mean by static indeterminacy ?
2. Concept of FBD for force analysis.
3. Define the theorems for finding moment of inertia about an axis.
4. Super-elevation in curvilinear motion.
5. D'Alembert's Principle.

(5 × 2 = 10 marks)

Part B

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

6. ABCD is a square whose side length is 2 m. Forces of magnitude 10, 20, 80 and 50 N act along AB, BC, CD and DA respectively. Forces of magnitude $50\sqrt{2}$ N and $20\sqrt{2}$ N act along the diagonal AC and DB respectively. Show that they are equivalent to a couple and calculate the moment of this couple.
7. A block of weight 20 Kg. is placed on a rough horizontal floor. If the co-efficient of friction is taken as 0.25, find the pull required to move the block if it is applied at an angle of 30 degree to the horizontal.
8. Locate the centroid of a trapezium with parallel sides a and b and height h.
9. Describe the motion of a projectile with suitable equation. Explain tangential and normal acceleration.
10. State and prove law of conservation of energy.
11. A body of mass 50 Kg. slides down a rough inclined plane whose inclination to the horizontal is 30 degree, if the co-efficient of friction between the plane and the body is 0.4. Determine the acceleration of the body.

(4 × 5 = 20 marks)

Turn over

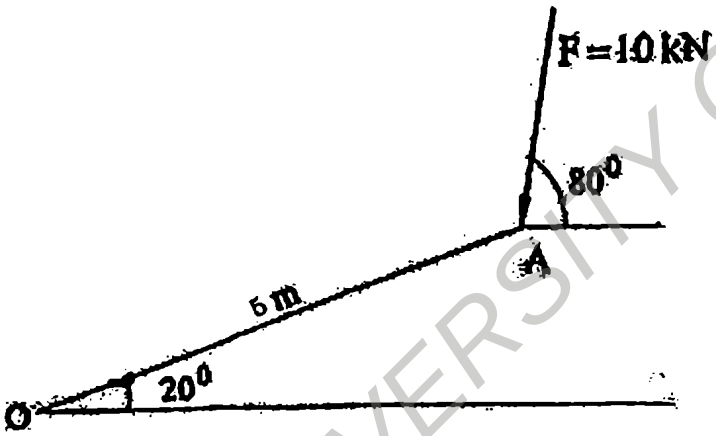
Part C

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

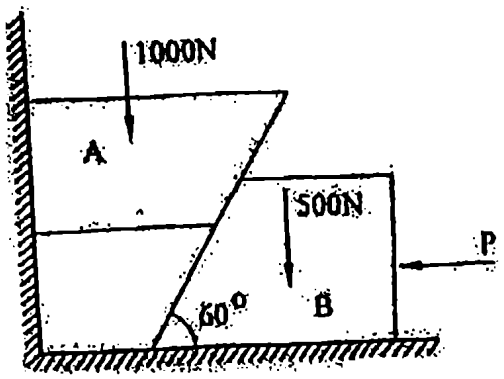
12. (a) Four forces equal to P, 2P, 3P and 4P are acting along four sides of a square ABCD taken in order. Find the characteristics of the resultant.

Or

(b) Calculate the moment of the given force F = 10 KN about point O as shown in figure.

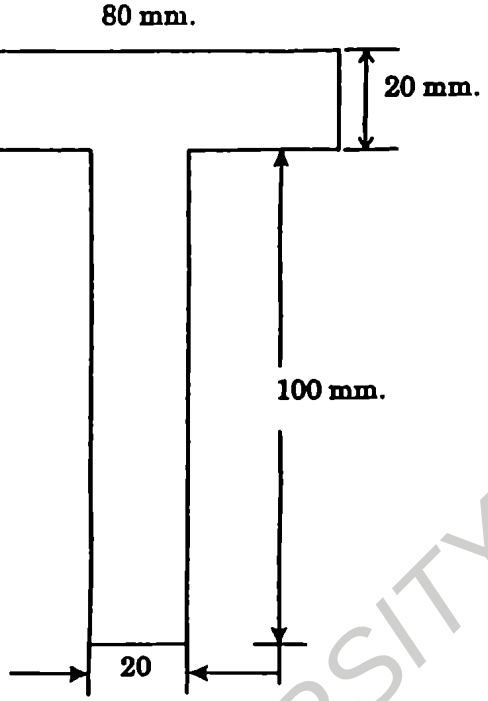


13. (a) Two blocks A and B are resting against a wall and a floor as shown in figure. Find the range of value of force P applied to the lower block for which the system remains in equilibrium. Co-efficient of friction is 0.25 for all the surfaces.



Or

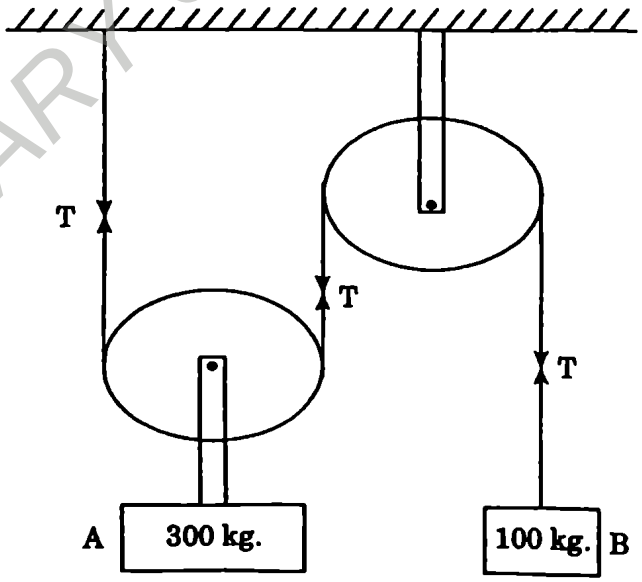
(b) Calculate the MI of a T section as shown in Figure about the centroidal axes.



14. (a) A car enters a curved road in the form of a quarter of a circle, of radius 100 m. at 18 Kmph and leaves at 36 Kmph. If the car is travelling at a constant tangential acceleration, find the magnitude and direction of acceleration when the car : (a) Enters ; and (b) Leaves the curved Portion of the road.

Or

(b) Determine the tension in the string and acceleration of the two bodies of mass 300 Kg. and 100 Kg. connected by a string and a frictionless and weightless pulley as shown in Figure.



15. (a) A train of mass 300 tonnes is at a certain instant moving at the rate of 54 Kmph up a gradient of 1 in 200. The resistance due to friction being 65 N/tonne. Find the power transmitted by the engine for uniform speed.

Or

(b) The motion of a particle is described by the following equations ;

$$x = 2(t+1)^2 \text{ and } y = \frac{2}{(t+1)^2}.$$

Show that the path travelled by the particle is rectangular hyperbola. Find the velocity and acceleration of the particle at time t = 1s.

(4 × 10 = 40 marks)

D 40842-A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

PTEN/EN 09 104—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define Hardness of water.
2. Explain Cloud and Pour point of a lubricant.
3. What are Storage Cells ?
4. Explain Pilling Bedworth rule.
5. What is Photochemical Smog ?

(5 × 2 = 10 marks)

Part B

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

6. Write about the engineering applications of nanomaterials.
7. What are liquid crystals ? How do they differ from crystalline state and liquid state ?
8. Mention the advantages of synthetic rubber over natural rubber.
9. Write short note on semi-solid lubricants.
10. What is e.m.f. ? How is it measured potentiometrically ?
11. Distinguish between BOD and COD.

(4 × 5 = 20 marks)

Part C

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

12. Describe water softening by Permutit Process. What are its advantages and disadvantages ?

Or

Give an account on the intrinsic and extrinsic Semiconductor materials.

Turn over

13. Explain the process of Compounding and Vulcanisation.

Or

Discuss the classification of lubricants with examples.

14. Explain Henderson's equation to determine the p^H of an acidic and basic buffer.

Or

What are concentration cells ? Derive an expression for the E.M.F. of concentration cells.

15. Discuss major types of corrosion.

Or

What is the effect of ozone depletion ? How does it occur ? What are the consequences ?

(4 × 10 = 40 marks)

D 40841-A (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

PTEN/EN 09 103—ENGINEERING PHYSICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. What is an interference filter ? Give its importance.
2. How Bragg's spectrometer is used to study the structure of crystals ?
3. What is polarimetry ? Discuss the terms Levorotatory and Dextrorotatory.
4. What is Zener diode ? Explain how it act as a voltage stabilizer.
5. Discuss the properties of ultrasonics.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Explain the phenomenon of diffraction at a straight edge.
7. Give the theory of Laurant's polarimeter.
8. Explain Meissner effect ? Distinguish between Type I and Type II superconductors.
9. Derive the relationship between the beta and alpha of a transistor.
10. Discuss the phenomenon of Piezoelectric effect and magnetostriction effect.
11. Explain the term 'Miller indices'. What is their role in crystal structure ?

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. Give theory and formation of wedge-shaped film. How these can be used to find the wavelength of light used ?

Or

What is double refraction in uniaxial crystals ? Explain about the positive and negative crystals.

13. (a) Explain Bragg's X-ray spectrometer and explain how it is used to determine wavelength of X-rays.

(b) Calculate the wavelength of X-ray beam incident at 12° for the first order reflection from a calcite crystal if the inner atomic spacing '*d*' for the crystal is 3.035 Å.

Or

Describe how a hologram is produced and viewed. What are its applications ?

Turn over

14. (a) Explain how free electrons behave in a metallic crystal lattice. Draw the typical energy distribution curve for these electrons with location of Fermi levels.

(b) Find the Fermi energy in Copper on the assumption that each Copper atom contributes one free electron to the electron gas. The density of Copper is 8.94×10^3 kg/m^3 and its atomic mass = 63.5 u. Given $u = 1.66 \times 10^{-27}$ kg.

Or

Explain the characteristics of a *npn* transistor in CE configuration with the following term :

(i) Input resistance.

(ii) Output resistance.

(iii) Current amplification factor.

15. Derive time dependent and time independent Schrödinger equation. What do you mean by normalization of a wave function.

Or

Explain in detail the properties and application of Nano materials. What are the advantages of Carbon Nanotubes ?

(4 × 10 = 40 marks)

D 40840-A (Pages : 3) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2018

PTEN/EN 09 102—ENGINEERING MATHEMATICS—II

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Solve $\frac{dy}{dx} + \frac{y}{x} = x$.

2. Find $\mathcal{L}\{t \sin zt\}$.

3. Find $\mathcal{L}^{-1}\left(\frac{s+1}{s^2}\right)$.

4. If $\phi = 2xz^4 - x^2y$ find $\nabla\phi$ at $(1, 1, 0)$.

5. Evaluate $\int_0^1 \int_x^{x^2} xy \, dy \, dx$.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Solve the differential equation $\left(D^2 + 5D + 4\right) y = e^{-x} + x^2 + 3$.

7. $\left(x\tan\left(\frac{y}{x}\right) - y\sec^2\left(\frac{y}{x}\right)\right) dx + x\sec^2\left(\frac{y}{x}\right) dy = 0$. Solve the equation.

8. Find $\mathcal{L}\left(\frac{\cos at - \cos bt}{t}\right)$.

9. Show that $\beta(m, n) = \frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$.

Turn over

10. What is the directional derivative of $\phi = x^2 y^4 + z^2 y^4 + x^2 z^4$ at the point $(2, 0, 3)$ in the direction of the normal to the surface $x^2 + y^2 + z^2 = 14$ at $(3, 2, 1)$.

11. Evaluate $\iint_S \bar{F} \cdot \hat{n}\, dS$ using divergence theorem where $\bar{F}\ axi + byj + czk$ and S is the surface of the sphere $x^2 + y^2 + z^2 = 1$.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. Using the method of variation of parameters solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^{-x} \log x$.

Or

Find the orthogonal trajectories of the family of circles $x^2 + y^2 + 2\lambda y + c = 2$, λ being the parameter.

13. Solve the differential equation $\frac{d^2y}{dx^2} + \frac{2dy}{dx} + y = e^{-x}$ if $y(0) = 0$ and $y'(0) = 1$. Using Laplace transforms.

Or

Apply convolution theorem to find the inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$.

14. If $\bar{r} = xi + yj + zk$ and $r = |\bar{r}|$ then prove the following :

(i) $\nabla f(r) = \frac{f'(r)}{r}\bar{r}$.

(ii) $\nabla^2 f(r) = \frac{2}{r} f'(r) + f''(r)$.

(iii) $f(r)\bar{r}$ is irrotational.

Or

If $\bar{F} = \left(y^2 - z^2 + 3yz - 2x\right) i + (3xz + 2xy)\, j + (3xy - 2xz + 2z)\, k$ show that $\bar{F}$ is both solenoidal and irrotational. Find also the scalar potential of $\bar{F}$.

15. Verify Green's theorem in the plane for $\oint_C (y - \sin x)\, dx + \cos x\, dy$ where C is the boundary of the triangle whose vertices are $(0, 0), \left(\pi/2, 0\right)$ and $\left(\frac{\pi}{2}, 1\right)$.

Or

(i) Using Stoke's theorem evaluate

$\int_C \bar{F} \cdot d\bar{r}$ where $\bar{F} = (2x + y - 2z)\, i + \left(2x - 4y + z^2\right) j + \left(x - 2y - z^2\right) k$ and C is the circle with centre $(0, 0, 3)$ and radius 5 units in the plane $z = 3$.

(ii) Show that $\int_A^B \left(2xy + z^3\right) dx + x^2\, dy + 3xz^2\, dz$ is independent of path joining the points A and B.

(4 × 10 = 40 marks)

C 4895 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

B.Tech.

EN 09 108 (A)—ENGINEERING GRAPHICS (A)

Time : Three Hours Maximum : 70 Marks

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

Part A

1. (a) Find graphically the length of a largest rod that can be kept inside a hollow cuboid measuring 60 mm. × 40 mm. × 30 mm.

Or

(b) A pentagonal plane with a 30 mm. side rests on the H.P on an edge such that surface is inclined at 45° to the H.P and the edge on which it rests is inclined at 30° to the V.P. Draw its projections.

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 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.

3. (a) In a semicircular plate with a 140 mm. diameter, a circular hole of largest size is made. The plate is then folded to form a cone. Draw the two views of the cone.

Or

(b) A square prism, having a base on the H.P. It is completely penetrated by another square prism having base with a 40 mm. side, such that their axes are 10 mm. apart. The axis of the penetrating prism is parallel to both H.P. and V.P. while the faces of both the prisms are equally inclined to the V.P. Draw the projections of the combination and show lines of intersection.

(3 × 14 = 42 marks)

Part B

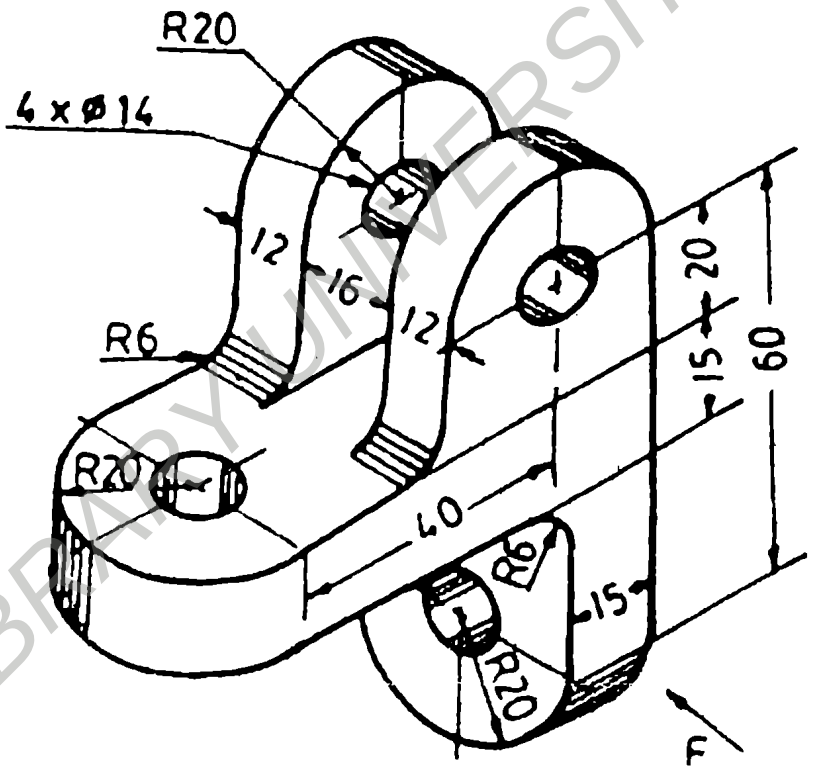
Answer any **two** *questions.*

Each question carries 14 *marks.*

4. (a) A square prism having a base with a 40 mm. side and 60 mm. 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) A hexagonal prism having base with a 30 mm. side and 40 mm. height is surmounted by a hemi-sphere such that the hemi-sphere is touching all the edges of the top base. Draw the isometric projection of the arrangement.

(c) Draw the dimensioned orthographic views (all *three*) of the object shown in figure below :



(2 × 14 = 28 marks)

C 4894 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2021

PTEN 09 107—ENVIRONMENT SCIENCE

(2009 Scheme)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. List and explain the different source of energy.
2. What are the advantage and limitation of solar device.
3. Briefly explain forest ecosystem.
4. Give a short note on solid waste management.
5. Briefly explain waste land reclamation.

(5 × 2 = 10 marks)

Part B

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

6. What are the prospects of renewable energy sources.
7. Explain the environmental effects of extracting and using mineral resources.
8. Briefly explain food chains and food webs.
9. What do you meant by conservation of biodiversity ?
10. Discuss the causes and effects of thermal pollution.
11. What are the problems of conversion of renewable energy resources into other form.

(4 × 5 = 20 marks)

Part C

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

12. How do forest support the economy of a nation ? Explain in detail.

Or

Explain in detail how timber extraction and mining cause deforestation. How it minimised ?

Turn over

13. Write an essay on endangered and endemic species of India.

Or

What is the importance and function of an ecosystem ? Explain the role of aquatic ecosystem to maintain structural and functional unit of biosphere.

14. Discuss the causes, effects and control measures of industrial wastes.

Or

Explain causes, effect and control measures of marine pollution.

15. Write an essay on sustainable use of natural resources.

Or

Write short note on :

(a) Climate change.

(b) Acid rain.

(c) Ozone layer depletion.

(4 × 10 = 40 marks)

C 4892 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

B.Tech.

EN 09 106—BASICS OF CIVIL AND MECHANICAL ENGINEERING

Time : Three Hours Maximum : 70 Marks

Section I and Section II are to be answered in separate answer books.

Section I (Basics of Civil Engineering)

Part A

Answer **all** *questions.*

1. What is the purpose of reinforced concrete ? (2 marks)
2. How the stone masonry is classified ? (2 marks)
3. What is the function of a beam ? (1 marks)

Part B

Answer any **two** *questions.*

4. Explain the principle of chain surveying.
5. Compare brick masonry and stone masonry.
6. What are the different types of cement ?

(2 × 5 = 10 marks)

Part C

Answer any **one** *full question.*

7. (a) Define beam, column and Lintel.

   (b) What are the different types of cement ? Explain the properties and uses ?

8. (a) Explain the principle of dumpy level for surveying.

   (b) State the properties and application of cement concrete.

(1 × 20 = 20 marks)

Turn over

Section II (Basics of Mechanical Engineering)

Part A

Answer **all** *questions.*

1. What is the function of draft tube ? (2 marks)
2. What is the function of carburettor ? (2 marks)
3. Define ton of refrigeration. (1 mark)

Part B

Answer any **two** *questions.*

4. Explain the working principle of CRDI engines.
5. Differentiate impulse turbine and reaction turbine.
6. Explain Brayton cycle with the help of PV and TS diagram.

(2 × 5 = 10 marks)

Part C

Answer any **one** *full question.*

7. (a) Explain the working principle of nuclear power plant with the help of neat sketch.

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

Or

8. (a) Explain 2 stroke petrol engines with the help of neat sketch.

   (b) What are the steps involved in casting process ?

(1 × 20 = 20 marks)

C 4891 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2021

PTEN 09 106—HUMANITICS AND COMMUNICATION SKILLS

(2009 Scheme)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Education and Society.
2. Reading between lines.
3. Note making and note taking.
4. Rights of engineers.
5. Moral dilemma.

(5 × 2 = 10 marks)

Part B

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

6. What are the causes of industrial revolution ?
7. Explain briefly the major inventions made by ancient China.
8. Face to face communication.
9. Skimming and Scanning.
10. Importance of technical communication.
11. Describe the method of preparing a C.V.

(4 × 5 = 20 marks)

Part C

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

12. (a) Discuss on the importance of body language and feedback in communication.

Or

(b) Discuss the impact of Science and Technology in the development of modern civilization.

Turn over

13. (a) An Engineer is socially responsible. Discuss the social responsibilities of an engineer.

Or

(b) Discuss the various moral issues involved in Engineering profession. How it can be resolved ?

14. (a) Write an essay on India's achievements in the fields of information and communication.

Or

(b) Explain the difference between oral communication and written communication. How can you make your communication very effective.

15. (a) What is professional Ethics ? Discuss the various moral issues faced by a professional.

Or

(b) Write an essay on the following topic : "Human Right Awareness should be made compulsory in Professional Colleges".

(4 × 10 = 40 marks)

C 4889 (Pages : 2) Name.....

Reg. No.....

FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

B.Tech.

PTEN/EN 09 104—ENGINEERING CHEMISTRY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Define carbonate and non-carbonate hardness of water.
2. Mention any two characteristics of nematic liquid crystals.
3. Give any two applications of polymers in electrical and electronic industry.
4. What is standard electrode potential ?
5. What is meant by sewage ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Write short note on carbon nanotubes & nanowires.
7. Describe the terms condensation polymerization and co-polymerisation with example.
8. Bring out any five differences between thermo plastics and thermosetting plastics.
9. State and explain Nernst equation. What are its applications ?
10. Describe the construction and working of H_2-O_2 fuel cell.
11. How are BOD & COD experimentally determined ?

(4 × 5 = 20 marks)

Part C

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

12. (a) (i) Discuss the electrical conductivity of solids based on band theory.

(ii) Write a short note on zone refining.

Or

(b) Explain the various steps involved in the purification of water for domestic use.

13. (a) Discuss the preparation, properties and technical applications of the following :

(i) UF.

(ii) Silicones.

(iii) Nylon 6, 6.

(iv) Dacron.

Or

(b) Write short notes on the following :

(i) Vulcanisation

(ii) Silicon rubber

(iii) Synthetic rubber

14. (a) Describe the construction of lead-acid battery with the reactions occurring during charging & discharging.

Or

(b) What is meant by pH ? Explain the measurement of pH using glass electrode.

15. (a) State & explain Pilling - Bedworth rule. Discuss the role of nature of oxide formed in oxidation corrosion

Or

(b) Discuss the passivation of metals by chemical treatment.

(4 × 10 = 40 marks)