

**PYB-101**  
**Examination – Dec- 2022**  
**B.Tech. I Sem : EE, ME, EI, EC, IoT**  
**Applied Physics**

Time : 2 Hrs

Max. Marks : 60

Min. Marks : 19

**Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a & b are compulsory while Part c & d has internal Choice. Assume missing data, if any.**

**Word limit be observed as follows:**

**Part a – Max 50 words,                      Part b – Max 50 words,**

**Part c – Max 100 words and              Part d – Max 400 words.**

**Word limit NOT to be followed for diagram, numerical, derivation.**

- Q.1 (a) Write down the postulates of planck's quantum hypothesis. 02  
 (b) Define the phase velocity and group velocity. 02  
 (c) What is wave function, write its properties. 03

**OR**

A microscope using photon is employed to locate an electron in an atom to within a distance  $2 \times 10^{-11}$  meter. What is the un certainty in the momentum of electron located in this way? 03

- (d) Deduce an expression for the compton shift. 05

**OR**

Obtain scherodinger time dependent wave equation. 05

- Q.2 (a) What are the main properties of LASER? 02  
 (b) Write the two important applications of LASER. 02  
 (c) Calculate the numerical aperture and acceptance angle for an optical fiber, given that refractive index of the core and the cladding is 1.41 and 1.40 respectively. 03

**OR**

Explain population inversion process. 03

- (d) Discuss the He – Ne LASER on the basis of ray diagram, construction and working. 05

**OR**

Explain the construction and re construction of image on hologram. 05

- Q.3 (a) What is effective mass? 02  
 (b) Define mobility of charge carriers. 02

(c)	Explain the properties of PN junction.	03
<b>OR</b>		
	Differentiate between direct and indirect band gap of semiconductor.	03
(d)	Explain the radiative and non radiative recombination mechanism in semiconductors.	05
<b>OR</b>		
	Explain the structure and characteristics of LED.	05
Q.4	(a) Define superconductor.	02
	(b) Differentiate type I and Type II superconductors.	02
	(c) What are the applications of superconductors?	03
<b>OR</b>		
	What are the applications of nanotechnology?	03
(d)	Discuss the BCS theory of superconductors.	05
<b>OR</b>		
	Explain the properties and uses of fullerene.	05
Q.5	(a) Differentiate between polar and non polar dielectric.	02
	(b) Define dielectric constant	02
	(c) What is piezoelectric effect? Give two application of piezoelectric material.	03
<b>OR</b>		
	What is piezo ceramics? Name the two mostly used piezo ceramics material.	03
(d)	Obtain the expression for gauss's law in dielectric.	05
<b>OR</b>		
	Define ferroelectric material. Write its properties.	05

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**MEA-101**  
**Examination –Dec- 2022**  
**B.Tech. I Sem : Mechanical Engineering**  
**Basic Mechanical Engineering**

Time :2Hrs

Max. Marks :60

Min. Marks :19

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- Q.1 (a) Write the name of different types of thermodynamic system with one example. 02
- (b) Define the first law of thermodynamics. 02
- (c) Define sensible heat, latent heat and dryness fraction. 03
- OR**
- Explain the various processes involve in vapor compression cycle with neat sketch. 03
- (d) What do you know about the Coefficient of Performance (COP). Generate the relationship between COPs of refrigerator and heat pump. 05
- OR**
- A refrigerator has a coefficient of performance equal to 5. If the refrigerator absorbs 120 J of thermal energy from a cold reservoir in each cycle, find 05
- (i) the work done in each cycle and
- (ii) thermal energy expelled to the hot reservoir.
- Q.2 (a) State the Newton's law of viscosity. 02
- (b) What do you understand by Newtonian and Non-Newtonian fluid? 02
- (c) Explain the viscous and turbulent flow. 03
- OR**
- Write down the working principle of fluid coupling. 03
- (d) State and prove the hydrostatic law. 05
- OR**
- Derive the Bernoulli's equation for perfect compressible fluid. 05
- Q.3 (a) List main parts of the I.C Engine with schematic diagram. 02
- (b) Write three main difference between two stroke and four stroke engine. 02

- (c) Draw the Otto cycle on P-V and T-S diagram and explain various processes. 03
- OR**
- Differentiate between diesel and petrol engine. 03
- (d) Explain valve timing diagram for four stroke Otto cycle. 05
- OR**
- An Otto cycle takes in air at 300 K. The ratio of maximum to minimum temperature is 6. Find out the optimum compression ratio for the maximum work output of the cycle. 05
- Q.4 (a) Classify the engineering materials. 02
- (b) How hardness of the material can be tested. 02
- (c) Define Hook's law. Draw the tensile stress-strain diagram with pointing various critical points. 03
- OR**
- What are the alloy steel? What is the various reason to make the alloy? 03
- (d) Draw and explain the Iron-Carbon equilibrium diagram. 05
- OR**
- Calculate the Young's modulus of a metallic rod of diameter of 30 mm and length 300 mm which is loaded with a tensile load of 60 kN, when the extension of the rod is equal to 0.3 mm. 05
- Q.5 (a) Write the names of renewable sources of energy. 02
- (b) How renewable energy is advantageous over conventional energy. 02
- (c) Explain the working principle of solar energy. 03
- OR**
- Write a short note on (i) Wind Energy; (ii) Geothermal Energy. 03
- (d) Explain the principle of Electric vehicles. What are the different factors which should be improved in electric vehicles? 05
- OR**
- What do you understand with solar collector? Write down the differences between concentrating and non-concentrating solar collectors. 05

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**MEA-102**  
**Examination – Dec- 2022**  
**B.Tech. I Sem: E&I, EC**  
**Engineering Graphics**

Time : 2 Hrs

Max. Marks : 60

Min. Marks : 19

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- Q.1 (a) The locus of an end of string being unwound from a circle keeping string tight is called 02  
 (i) Cycloid (ii) Parabola (iii) Spiral (iv) Involute
- (b) A curve traced out by a point moving uniformly along a straight line towards the pole, while the line revolves about its one of the ends with uniform angular velocity is 02  
 (i) Cycloid (i) Involute (iii) Archimedean spiral (iv) Logarithmic spiral
- (c) A cube of 5 cm side represents a tank of 1000 cubic metres volume, find the RF. 03
- OR**
- If 1 centimetre long line on a map represents a real length of 4 metres, calculate the RF. 03
- (d) The major and minor axes of an ellipse are 110 mm and 70 mm respectively. Draw an ellipse 05
- OR**
- Construct a scale of 1:40 to read meters and decimeters and long enough to measure up to 6 m. Show a distance of 5.2 m on it. 05
- Q.2 (a) HT (horizontal Trace) of a line is 02  
 (i) A point on HP where line meets to HP  
 (ii) A point above HP where line ends  
 (iii) Both i & ii  
 (iv) A point on VP where line meets to VP
- (b) If a line is perpendicular to HP its position with respect VP will be 02  
 (i) Inclined  
 (ii) Perpendicular  
 (iii) Parallel  
 (iv) None of these
- (c) Point C 30 mm above H.P. and in the V.P. another point D is 50 mm above HP and 40 mm in front of VP draw projections of line joining both these points if distance between end projectors are 60 mm apart. 03

**OR**

What are differences between first angle projection and third angle projection system? 03

- (d) The top view of a line PQ measures 60 mm. The line is parallel to the VP and inclined at  $45^\circ$  to the HP. One end of the line is 25 mm in front of the VP and lies on the HP. Draw its projections and determine the true length. 05

**OR**

The top view of an 80 mm long line AB measures 55 mm. The line is in the VP and its one end being 20 mm above the HP. Draw its projections and find inclination with the HP. 05

- Q.3 (a) If a regular hexagonal plane appears as a straight line in the top view and as regular hexagon in front view, the plane may be 02
- (i) Parallel to HP and perpendicular to VP
  - (ii) Parallel to HP and inclined to VP
  - (iii) Parallel to VP and perpendicular to HP
  - (iv) Parallel to VP and inclined to HP
- (b) The position of a square pyramid may be when in front view true length of axis is visible and in top view the shorter length of axis parallel to XY is visible. 02
- (i) Inclined to HP having an edge or corner of base on HP
  - (ii) Inclined to VP having an edge or corner of base on VP
  - (iii) Resting in HP on its base
  - (iv) Resting in VP on its base
- (c) Draw projection of a rectangular plane sides 70 mm and 35 mm is on HP such that its shorter edges are perpendicular to VP. 03

**OR**

What are the different types of lines used in projection of solids? 03

- (d) A square plane of diagonal 70 mm is kept in such a way that its top view appears as a rhombus of 70 mm and 45 mm diagonals. Draw its projections and determine inclination of the plane with the HP. 05

**OR**

A cone of base diameter 50 mm and axis 60 mm has its base parallel to and 10 mm above the HP while the axis is parallel to and 40 mm in front of the VP. Draw its projections. 05

- Q.4 (a) A pentagonal pyramid resting on HP is cut by section plane such that it passes through the midpoint of the axis and inclined to base. 02
- (i) The sectional front view will be a regular hexagon
  - (ii) The sectional top view will be a hexagon of irregular shape.
  - (iii) The sectional front view will be a hexagon of irregular shape.
  - (iv) The sectional top view will be a regular hexagon
- (b) The development of surface of a prism is obtained by the following method 02
- (i) Radial line
  - (ii) Parallel line
  - (iii) Triangulation
  - (iv) approximation

- (c) What are the dimensions of a cone if its development is a semicircle of 120 mm diameter? 03

**OR**

With the example explain AIP and AVP. 03

- (d) A hexagonal pyramid of base side 30 mm and axis 65 mm is resting on its base in the HP with an edge of the base parallel to the VP. A horizontal section plane cuts the pyramid bisecting the axis. Draw its front view and sectional top view. 05

**OR**

Draw the development of the lateral surfaces of a square pyramid of base side 40 mm and axis 60 mm, resting on its base on the HP such that all the sides of the base are equally inclined to the VP. 05

- Q.5 (a) The angle that isometric axes make with each other 02
- (i)  $45^{\circ}$
  - (ii)  $60^{\circ}$
  - (iii)  $90^{\circ}$
  - (iv)  $120^{\circ}$

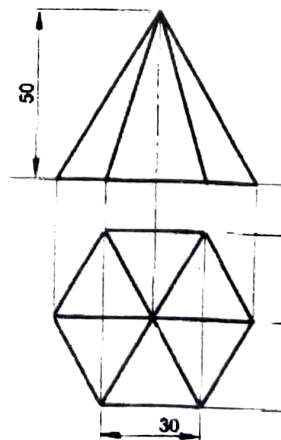
- (b) In comparison to an isometric projection, the appearance of an isometric view is 02
- (i) Larger
  - (ii) Smaller
  - (iii) More accurate
  - (iv) More realistic

- (c) Draw isometric view of circular plane of 40 mm diameter. 03

**OR**

What are different editing commands in CAD 03

- (d) Draw isometric view of hexagonal pyramid given below. All Dimensions are in mm. 05



**OR**

Explain any two methods of drawing a circle in AutoCad. 05

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**MEA-103**  
**Examination –Dec- 2022**  
**B.Tech. I Sem : Mechanical Engineering**  
**Engineering Mechanics**

Time : 2 Hrs

Max. Marks : 60  
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- Q.1 (a) Differentiate between Moments of a Force & Couple. 02  
 (b) Explain Free body diagram with figure. 02  
 (c) State & Prove Varignon’s theorem. 03

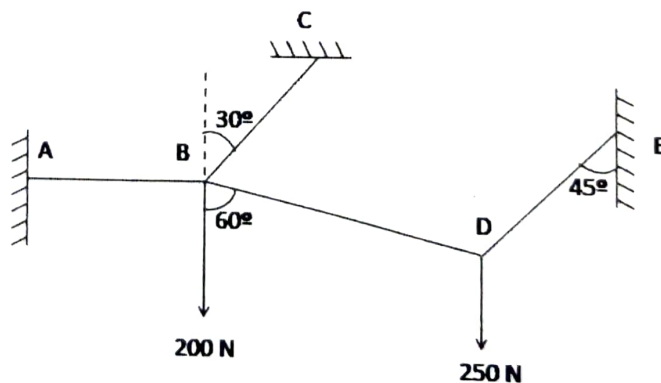
**OR**

Explain the Resolution of a force into a force & a couple. 03

- (d) The resultant of two forces, one of which is double the other is 260 N. If the direction of the larger force is reversed and the others remain unaltered, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between the forces. 05

**OR**

A system of connected flexible cables shown in figure is supporting two vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the cables. 05



- Q.2 (a) Define Coefficient of friction. 02  
 (b) What is angle of repose? 02  
 (c) What is the Laws of Friction? Explain 03

**OR**

Define the following terms

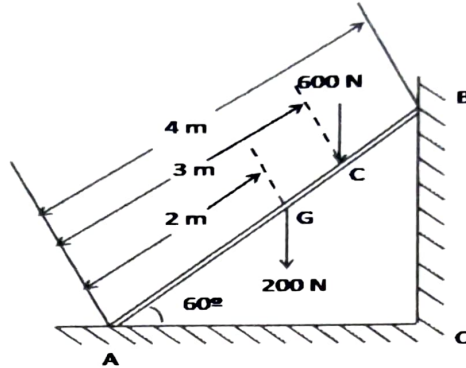
- (i) Limiting friction 03  
 (ii) Static Friction  
 (iii) Dynamic friction



- (d) A block weighing 500 N just starts moving down a rough inclined plane when supported by a force of 200 N acting parallel to the plane in upward direction. The same block is on the verge of moving up the plane when pulled by a force of 300 N acting parallel to the plane. Find the inclination of the plane and the coefficient of the friction between the inclined plane and the block. 05

**OR**

A ladder of length 4 m, weighing 200 N is placed against a vertical wall as shown in the figure. The coefficient of friction between the wall and the ladder is 0.2 and that between the floor and the ladder is 0.3. In addition to self weight, the ladder has to support a man weighing 600 N at a distance of 3 m from A. Calculate the minimum horizontal force to be applied at A to prevent slipping. 05



- Q.3 (a) Differentiate between Centroid & Centre of Gravity. 02  
 (b) Define the term polar moment of inertia. 02  
 (c) State & Prove Perpendicular axis theorem. 03

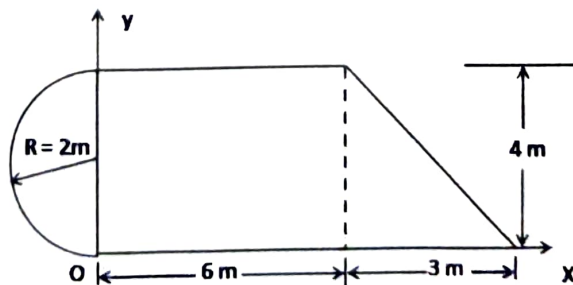
**OR**

Derive an expression for moment of inertia of a circle about its diametric axis. 03

- (d) Derive the expression of Centroid of triangle using first principle. 05

**OR**

Determine the Centroid of the area as shown in figure with respect to the axes shown. 05



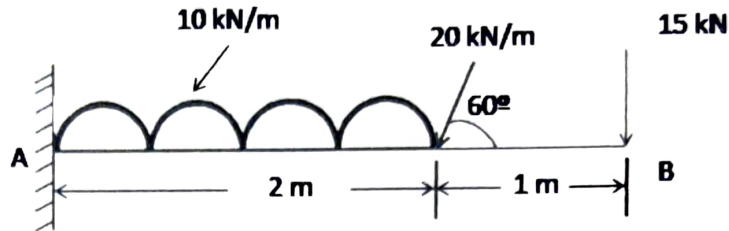
- Q.4 (a) List the different type of supports. 02  
 (b) Define statically determinate beam. 02

(c) What is the Point of Inflexion/Contra-flexure? Explain with figure. 03

OR

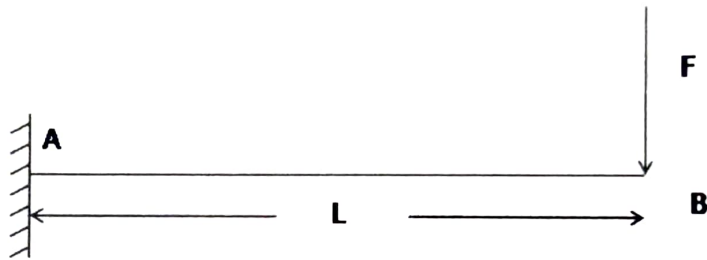
What is the difference among propped cantilever, Continuous Beam and Overhanging Beam? Explain with figures. 03

(d) Determine the reactions developed in the cantilever beam as shown in figure. 05



OR

Draw the SFD (Shear Force Diagram) and BMD (Bending Moment Diagram) of the Cantilever Beam as shown in the figure. 05



Q.5 (a) List the different methods used in the analysis of trusses. 02

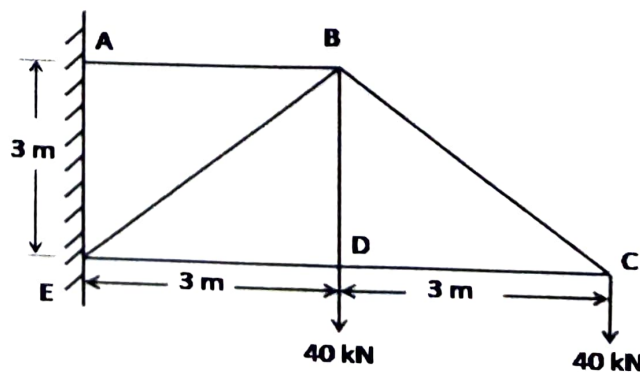
(b) Differentiate between plane frame and space frame with examples. 02

(c) What are the assumptions made in the analysis of pin jointed trusses? 03

OR

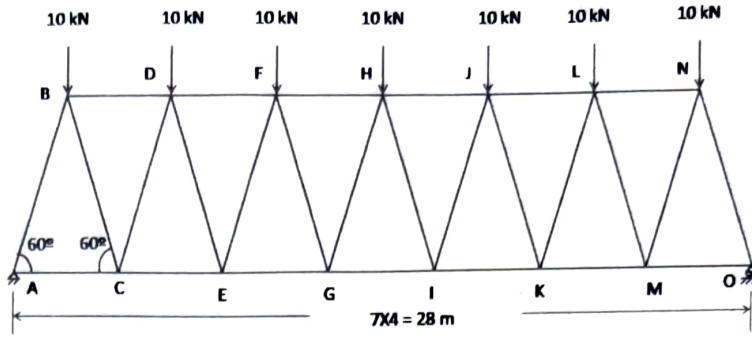
Define Perfect frame, Deficient frame & Redundant frames. 03

(d) Find the forces in all the members of the truss as shown in figure. Tabulate the results. 05



OR

Determine the forces in the member FH, HG and GI in the truss as shown in figure. 05  
Each load is 10 kN and all triangles are equilateral with sides equal to 4m.



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