## PROVINCIAL MANAGEMENT SERVICE, ETC -2022
## CASE NO. 2C2023

**SUBJECT:** PRINCIPLE OF ENGINEERING (PAPER-I)

**TIME ALLOWED:** THREE HOURS          **MAXIMUM MARKS: 100**

**NOTE:**
i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
iv. Extra attempt of any question or any part of the question will not be considered.

**NOTE:** Attempt any **FIVE** questions in all. Non-Programmable calculator is allowed. Draw clear diagrams where necessary.

**Q.No.1**    **a)** What is difference between wave mechanics and matrix mechanics? What is wave particle duality? Why does wave nature of matter is not more apparent in our everyday life?

          **b)** What do you understand by the term "superconductivity"? Discuss low temperature and high temperature superconductors and their applications. **(10+10=20 Marks)**

**Q.No.2**    **a)** What are effects of different Crystalline structure on same substance on its properties?

          **b)** Discuss in detail heat capacity of solids and gases. What is the significance of gas constant?

          **c)** Explain in detail Graham's Law of Diffusion and Roult's law.

                                      **(7+7+6=20 Marks)**

**Q.No.3**    **a)** What do you understand by electromagnetic induction? Explain, how Lenz's law is helpful in determining the direction of induced current?

          **b)** What must be the magnitude of an isolated positive charge for the electric potential of 120 V at 15 cm from the charge?

          **c)** What do you understand by magnetic hysteresis? **(10+5+5=20 Marks)**

**Q.No.4**    **a)** Discuss in detail AC Induction motor and synchronous motor and compare their Performance and Efficiency.

          **b)** Explain Copper & Iron Losses in step-up/step-down Transformers.
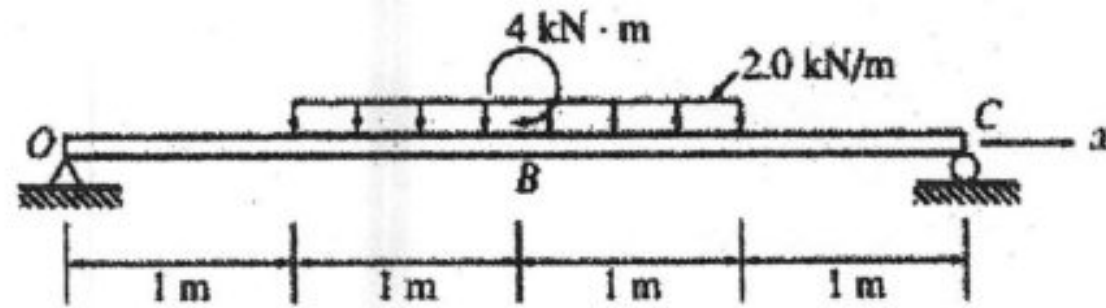
                                      **(10+10=20 Marks)**

**Q.No.5**    **a)** In given Fig. assume that a 20-mm-diameter rivet joins the plates that are each 110 mm wide. The allowable stresses are 120 MPa for bearing in the plate material and 60 MPa for shearing of rivet. Determine (a) the minimum thickness of each plate; and (b) the largest average tensile stress in the plates.

**b)** For the beam, simply supported at the ends and loaded as shown, write equations for the shearing force and bending moment at any point along the length of the beam. Also, draw the shearing force and bending moment diagrams.



**(10+10=20 Marks)**

**Q.No.6**   **a)** Some of the engine experts have the opinion that two stroke petrol engines are noisy & dirty, and it is a dying technology. What is your opinion? Give reasons to support your thoughts.

**b)** Describe Casting and Forging manufacturing processes.

**c)** Explain in detail Carnot cycle.

**(10+5+5=20 Marks)**

**Q.No.7**   **a)** Write detailed notes on the following terms:

i) Diffusion in Ceramics    ii) Creep Resistant Materials

**b)** The Young's moduli of alkali metals are given below in units of GN m–2:

Li (11.5), Na (9.0), K (3.5), Rb (2.7), Cs (1.8) and Fr (1.7). Compare this with the corresponding values of the melting points. Give a reason for this sequence

**(10+10=20 Marks)**

**Q.No.8**   **a)** Differentiate between beams and columns.

**b)** What is the roll of traffic appraisal in highway administration and scheme preparation?

**c)** What kind of impacts have water resources projects on Environment in Pakistan?

**d)** What are the different kinds of pressure measuring devices used in engineering applications?

**(5+5+5+5=20 Marks)**