Ref. No.: Ex/PE/PC/B/T/224/2024

**B.E. POWER ENGINEERING SECOND YEAR SECOND SEMESTER EXAMINATION – 2024**

**Subject: APPLIED SOLID MECHANICS AND MECHANISMS**

**Time: 3 Hours** **Full Marks: 100**

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## Group A(CO1)

### Answer any two (2) from the following questions.

1. (a) What is the relation between stress and strain?

(b) Derive the expression for Mohr's circle diagram.

(c) If at a point in a body $\sigma_x = 70$ MPa and $\sigma_y = 60$ MPa and $\tau_{xy} = -5$ MPa then what will be the radius of the Mohr's circle. *5+10+5=20 Marks*

2. (a) What is Stress-Strain Curve? Explain

(b) A wire 2 m long and 2 mm in diameter, when stretched by weight of 8 kg has its length increased by 0.24 mm. Find stress, strain and Young's modulus of material of the wire. g=9.8m/sec *10+10=20 Marks*

3. (a) Show that for a torsion in circular shaft, $\tau_{max} = \frac{16T}{\pi d^3}$

(b) Draw SFD & BMD for a Cantilever beam subjected to concentrated load at free end.

*10+10=20 Marks*

## Group B

### Answer all from the following questions.

3. (a) Explain with diagram of a quick return mechanism for shaping machine.

(b) Write down the Kutzbach criterion for planar mechanism.

(c) What is the difference between higher pair and lower pair? [CO2]

*8+6+6=20 Marks*

4. Derive the expression for displacement, velocity and acceleration of a single slider-crank mechanism. *20 Marks*

[ Turn over

Or. Prove that natural frequency for transverse vibration is given by.

$$f_n = \frac{0.4985}{\sqrt{\delta}}$$

where δ is the static deflection of the spring in metres [CO3]

5. (a) Define the following terms for a gear. *4 x 3 =12 Marks*

(i) Pitch circle (ii) Module (iii) Dedendum (iv) Backlash

(b) A compound gear train with gears P, Q, R, and S has a number of teeth 20, 40, 15 and 20 respectively. Gears Q and R are mounted on the same shaft as shown in the figure below. The diameter of the gear Q is twice that of the gear R. If the module of the gear R is 2 mm, then how much is the centre distance in mm between gears P and S? [CO4]

*8 Marks*