[This question paper contains 4 printed pages]

Roll No.	

ASME-23B-MENG-I

MECHANICAL ENGINEERING (PAPER-I)

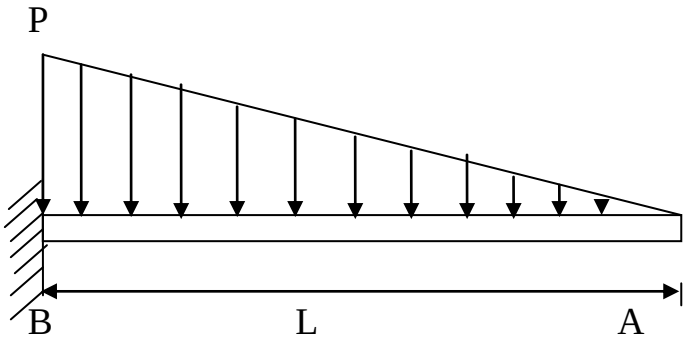
Time Allowed: 3 Hours [Maximum Marks: 100

QUESTION PAPER SPECIFIC INSTRUCTIONS

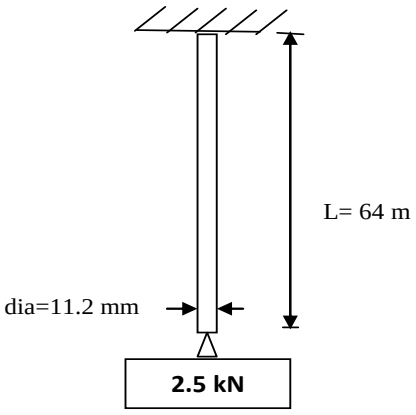
Please read the following instructions carefully before attempting questions.

1. There are EIGHT questions printed in English.
2. Candidate has to attempt FIVE questions in all.
3. Question No.1 is compulsory. Out of the remaining SEVEN questions, FOUR are to be attempted.
4. All questions carry equal marks. The number of marks carried by a question / part are indicated against it.
5. Write answers in legible handwriting.
6. Wherever any assumptions are made for answering a question, they must be clearly indicated.
7. Diagrams / Figures, wherever required, shall be drawn neatly. Unless otherwise mentioned, symbols and notations carry their usual standard meanings.
8. Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in answer book must be clearly struck off.
9. Re-evaluation / Re-checking of answer book of the candidate is not allowed.
10. Use of calculators is allowed.

1. As shown in the figure below; a cantilever beam AB of length L is fixed at end B and is free at end A. The beam is subjected to a gradual varying load with intensity of load being zero at end A and maximum intensity of load being P at end B. Derive an expression for shear stress and bending moment at the midpoint of the beam. If length of the beam is 4 m and it carries a gradual loading with zero at free end & 60 kN/m at fixed end; draw BM and SF diagrams for the beam. 20



2 (a) Draw an illustrated 'stress-strain' diagram for a typical structural steel. As shown in the figure below; a metal rod is hanging from a structure and is holding a weight of 2.5 kN at its lower end. The rod is 64 meters long and has a circular cross section with a diameter of 11.20 mm. The metal has a weight density of 86.0 kN/m^3. Calculate the amount of maximum stress in the rod; without ignoring the weight of the rod itself. 10



(b) What is a thin cylinder? Derive an expression each for circumferential stress as well as longitudinal stress, which may be responsible for failure of a thin cylindrical shell having length = L , diameter = D , thickness of the wall = T and intensity of the internal pressure = P. 10

3. (a) Draw the follower displacement curve and derive an expression for velocity and acceleration of the follower when it moves with simple harmonic motion. 10

(b) Explain the concept of 'undercutting of gears'. Using sketches; also describe the working of simple gear train, compound gear train and reverted gear train. 10

4. What is 'Quick Return Mechanism' and what are its different components. Using a sketch, describe the functioning of "Whitworth Quick Return Mechanism' and how is it different from slotted-lever mechanism. Also discuss the advantages, disadvantages and applications of quick return mechanisms. 20

5. With reference to TTT diagram; with the help of sketches, explain the processes of austempering and martempering. Also explain the objectives and applications of annealing process. 20

6. Explain the following, using neat sketches. 5x4

a) Centrifugal casting process, its advantages and applications.

b) Machine moulding with squeeze moulding machine.

c) Types of risers.

d) Slush casting.

7. (a) Using sketches, describe the working of 'direct extrusion process' and 'indirect extrusion process' for hot working of metals. Also discuss the advantages and drawbacks of extrusion process. 10

(b) Why is 'Electron Beam Machining' a non-conventional machining process? Explain the working, applications and limitations of this machining process. 10

8. (a) A factory uses 1450 casings every month, which are outsourced from a supplier. These castings cost Rs 2400 per dozen. If carrying cost is 8% and ordering cost is Rs. 550; calculate 'Economic Order Quantity', number of orders per year and order interval (assume 365 working days per year). Write briefly on 'ABC Analysis' system of inventory management. 10

(b) A construction schedule consists of the following jobs: 10

Job	1-2	2-3	2-4	3-4	3-5	4-6	5-8	6-7	6-10	7-9	8-9	9-10	10 - 11
Time	3	7	4	3	5	3	5	8	4	4	1	1	4

Assuming time in days, calculate the project completion time. Also draw the network diagram and find the critical path. Explain the terms: total float, free float and independent float.

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