

3RD SEM./AERO./DIP.MECH/MECH(MAIN/PROD/SAND/ IND.INT/AUTO)/
MECH. ENGG 2020(W)NEW
Th-1- Production Technology

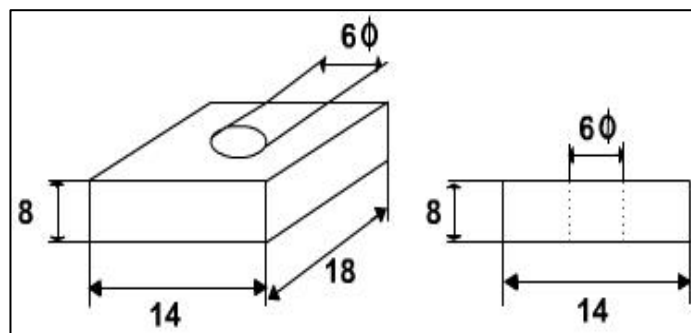
Full Marks: 80

Time- 3 Hrs

Answer any **five** Questions including Q No.1 & 2
Figures in the right-hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. What is blanking operation?
 - b. Why cores are needed in casting?
 - c. Explain Sintering process.
 - d. Why dies are used in press work?
 - e. Name any two materials suitable for Oxy-acetylene Welding Process.
 - f. Jigs & Fixtures increases the production cycle time (True/False). Justify your answer.
 - g. Define Extrusion process.
 - h. Classify the different types of Rolling Process.
 - i. What are the benefits of Production Technology in Engineering?
 - j. What do we understand by economics of casting?

2. Answer **Any Six** Questions 6 x 5
 - a. The machining allowance for cast iron for size up to 12 inch is 0.12 inch and from 12 inch to 20 inch is 0.20 inch. Redraw the dimension of the part shown in the figure with dimensions including machining allowance.



- b. Discuss about the oxidizing and reducing zones of a cupola furnace.
- c. Compare Jigs with Fixtures
- d. Explain Resistance welding process.
- e. Discuss about the various types of punches.
- f. Compare hot rolling with cold rolling.
- g. List the different advantages of powder metallurgy.

3	Explain 3-2-1 point location of a rectangular jig.	10
4	Write short notes on:	10
a	Compound Dies	
b	Direct Extrusion	
c	Blending	
d	Undercut	
5	Discuss about various types of destructive and non-destructive types of tests carried out to detect welding defects.	10
6	Explain GMAW process with neat sketch.	10
7	Discuss about any five types of casting defects, its causes and remedies.	10

Th-2 Strength of Material

Full Marks:80

TIME:3 Hour

Answer any five question including QNO 1 & 2 are compulsory.

Figures in the right hand margin indicate marks.

N01. Answer all questions. (2X10)

- (a) Define temperature stress
- (b) What is the difference between stress and strain?
- (c) Define point of contra-flexure.
- (d) Define cantilever beam with example.
- (e) What is resilience?
- (f) What do you mean by hoop stress and longitudinal stress?
- (g) What do you mean by column?
- (h) Define torsion
- (i) What do you mean by section modulus?
- (j) Define principal stress and its uses.

N02. Answer any six questions. (5X6)

- (a) A rod 150cm long and of diameter 2.0cm is subjected to an axial pull of 20KN. If the modulus of elasticity of the material of the rod is $2 \times 10^5 \text{ N/mm}^2$. Determine (I) the stress (II) the strain, and (III) the elongation of the rod.
- (b) Show diagrammatically different types of beams and loads.
- (c) What are the assumptions taken while deriving bending equations under theory of simple bending?
- (d) Derive expression for hoop stress and longitudinal stress in case of thin cylindrical shell.
- (e) Find the maximum shear stress induced in a solid circular shaft of diameter 15cm when the shaft transmits 150kw power at 180 r.p.m
- (f) Derive the formula section modulus for rectangular section and circular section.
- (g) Derive relationship between modulus of elasticity and modulus of rigidity.
- (h) A point in a strained material is subjected to two mutually perpendicular tensile stresses of 200Mpa and 100Mpa. Determine the intensities of normal, shear and resultant stresses on a plane inclined at 30° with the axis of minor tensile stress.

NO3. Prove the relation

$$M/I = \sigma/y = E/R$$

Where M= bending moment

I= moment of inertia

σ = bending stress in a fibre, at a distance y from the neutral axis

E= young's modulus and

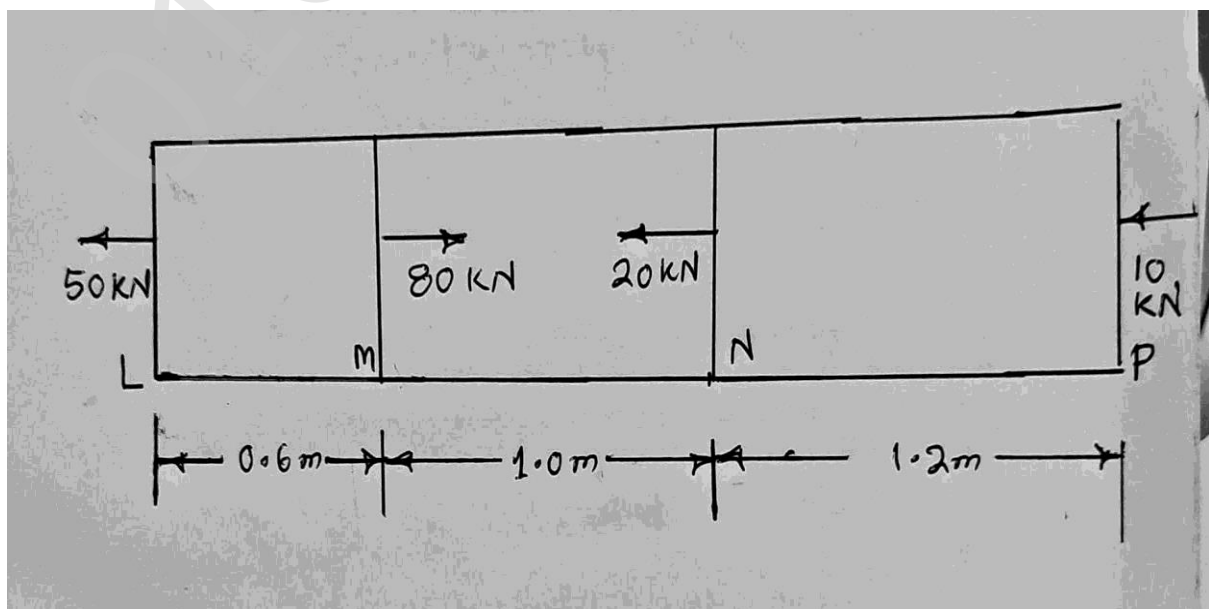
R= radius of curvature (10)

NO4. A simply supported beam of length 6m carries point load of 3kN and 6kN at distances of 2m and 4m from the left end. Draw the shear force and bending moment diagram for the beam. (10)

NO5. A reinforced short concrete column 250mmX250mm in section is reinforced with 8 steel bars. The total area of steel bars is 2500mm². The column carries a load of 390kN. If the modulus of elasticity for steel is 15 times that of concrete, find the stresses in concrete and steel. (10)

NO6. Define buckling load. State formula for buckling load in column with various end condition. (10)

NO7. A brass bar having cross-sectional area of 1000mm² is subjected to axial forces shown in the figure. Find the total elongation of the bar. Modulus of elasticity of brass is 100GN/m². (10)



Full Marks:80

TH3-Engineering Material

Time:3Hours

Answer any **Five** Questions including Q No. 1&2
Figures in the right hand margin indicates marks

1. Answer all questions 2×10
 - (a) What do you mean by Ductility?
 - (b) Give any two suitable examples of nonferrous material.
 - (c) Write down any two applications of low carbon steel.
 - (d) What is phase diagram?
 - (e) What are the limitations of a iron-carbon 'phase diagram?
 - (f) What do you mean by Point defect in a crystal?
 - (g) What do you mean by Tempering?
 - (h) Write down the composition of Brass.
 - (i) Give any two suitable examples of ceramic material.
 - (j) Write down any two properties of elastomers.
2. Answer any six questions 5×6
 - (a) Briefly classify materials into ferrous and non ferrous category.
 - (b) Write down the effects of various alloying elements such as Cr, Mn, Ni and V on mechanical properties of ferrous materials.
 - (c) Write down the difference between Edge and Screw dislocation.
 - (d) Briefly explain carburizing process.
 - (e) Write down the composition, property and usage of Duralumin.
 - (f) Differentiate between thermosetting and thermoplastic polymers.
 - (g) Briefly classify ceramics and write down their uses.

Full Marks: 80

Th-4 Thermal Engineering-I

Time- 3 Hrs

Answer any five Questions including Q No.1 & 2
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2 x 10

1. Answer All questions

- State the Zeroth law of thermodynamics.
- In which process work done is equal to heat transfer and how?
- What is mechanical equivalent of heat?
- Define intensive and extensive properties with example.
- Define C.O.P of a refrigerator.
- What is stroke length of an I.C engine?
- Draw P-V and T-S diagram of otto cycle.
- State Clausius's statement of 2nd law of thermodynamics.
- Define cetane number.
- State Boyle's law.

6 x 5

2. Answer Any Six Questions:

- Derive the relationship between C_p , C_v & R .
- Differentiate between 2-stroke and 4-stroke engine.
- State and explain the 1st law of thermodynamics.
- Define fuel and explain the various classifications of fuels.
- In a non-flow process, a gas expands from volume 1m^3 to a volume of 2m^3 according to the law $P = 2/v^{1.5}$, where P is the pressure at any point in its path in bar and V is the volume at the same point in m^3 . Determine (1) pressure at the end of expansion in KN/m^2 and (2) work done by the gas doing expansion in kJ.
- An ideal heat engine works on carnot cycle between the temperature limits of 327°C and 77°C . If 550kJ of heat is supplied to the working medium during a cycle of operation then find the
(1) thermal efficiency of the cycle and
(2) quantity of heat rejected.
- An engine working on Otto cycle has a cylinder diameter of 200mm and stroke of 300mm clearance volume is 150000mm^3 . Determine the air standard efficiency for the engine.

3. What is an isothermal process? Derive an expression for the work done during isothermal process. 10

4. 0.12m^3 of air at a temperature of 20°C and pressure of 1.1bar is compressed to 20 bar according to the law $PV^{1.3} = c$. Determine the following: 10

- End volume
- End temperature and
- Work required for compression

5. An ideal diesel engine has a diameter 150mm and stroke 200mm . The clearance volume is 10 percent of the swept volume. Determine the compression ratio and the air standard efficiency of the engine is cut-off takes place at 6 percent of the stroke. 10

6. State the general energy equation of a gas for a steady flow process. 10

7. What is quasi-static process? 2

Explain briefly Otto cycle with the help of P-V and T-S diagram, and derive an expression for the ideal efficiency of Otto cycle. 8

Full Marks: 80

TH 5 Environmental Studies

Time- 3 Hrs

Answer any five Questions including Q No.1 & 2
Figures in the right hand margin indicates marks

1. Answer All questions 2 x 10
 - a. Define Environment.
 - b. Define deforestation.
 - c. What do you mean by decomposers?
 - d. What are hot spots of biodiversity?
 - e. Define eco system.
 - f. Write down psychological effect of noise pollution.
 - g. What is solid waste management?
 - h. Define green house effect.
 - i. What are the major reasons of population explosion?
 - j. What is Draught?
2. Answer Any Six Questions 6 x 5
 - a. What are causes of deforestation.
 - b. What are the environmental effects of mining.
 - c. Give a brief description about structures of a pond eco -system.
 - d. Discuss about 3R in controlling environmental pollution.
 - e. What is global warming ? Write down the effects of global warming?
 - f. Discuss about rain water harvesting?
 - g. What is the role of an individual in controlling pollution of environment?
3. What is the need of land resources? Write the main reasons of degradation of land? 10
4. What are the changes made in agriculture? Write down the impacts of modern agriculture on environment? 10
5. What are ecological pyramids? Explain the pyramid of number and pyramid of energy? 10
6. Explain the sources of solid waste and solid waste management? 10
7. Write short notes on 10
 - a. World food problem
 - b. Acid rain