

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. Define Impact extrusion process.
 - b. Define Rolling process and classify its various types.
 - c. Write different types of flames used in Oxy-acetylene welding process.
 - d. What is pattern? State different type of pattern in foundry shop.
 - e. State the function of flux in welding.
 - f. Define porosity and its remedies.
 - g. What is the function of chill and chaplet?
 - h. Define Powder Metallurgy process.
 - i. Define piercing and trimming.
 - j. What do understand by permeability?

2. Answer **Any Six** Questions 6 x 5
 - a. State five numbers of welding defects, its causes and remedies.
 - b. Explain sintering process.
 - c. Explain different type of pattern allowances.
 - d. Differentiate between TIG and MIG welding process.
 - e. Explain different types of moulding sands with its compositions.
 - f. Explain Compound die and Progressive die.
 - g. What is Centrifugal casting? Explain with neat sketch.

3. Describe the construction and working principle of Cupola furnace with a neat sketch. 10
4. Explain 3-2-1 location of rectangular jig. 10
5. What is Resistance welding process? Explain Spot welding and Seam welding with a neat sketch. 10
6. Explain different type of Casting defects and its remedies. 10
7. Explain the process of Power Metallurgy. 10

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MECH(PROD.)/ MECH(SAND.)/ MECH (IND.INT.)/ 2022(W)**

Th-2 Strength of Material

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. Define Poisson's ratio.
 - b. What is meant by Shear force diagram and Bending moment diagram?
 - c. Define the point of contra-flexure.
 - d. Define column.
 - e. What is meant by Temperature stress?
 - f. What do you mean by Section modulus?
 - g. Define Principal Stress and Principal Plane.
 - h. What is the function of shaft? Write down the formula for power transmitted by a shaft.
 - i. Define cantilever beam with example.
 - j. What is meant by thin cylinder shell? State its application.

2. Answer **Any Six** Questions 6 x 5
 - a. A hollow cylinder 2m long has an outside diameter of 50mm and inside diameter of 30mm. If the cylinder is carrying a load of 25kN, find the stress in the cylinder. Also find the deformation of the cylinder, if the modulus of elasticity for the cylinder material is 100GPa.
 - b. The stresses at point of a machine component are 150MPa and 50MPa both tensile. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of 55° with the axis of major tensile stress.
 - c. Show diagrammatically different types of beams and loads.
 - d. What are the various assumptions taken while deriving bending equations under theory of simple bending?
 - e. Derive a formula for the longitudinal stress in a thin cylindrical shell subjected to an internal pressure.
 - f. Write down the assumption taken for finding out the torsion formula.
 - g. A solid circular shaft of 100mm diameter is transmitting 120kW at 150 rpm. Find the intensity of shear stress in the shaft.

- 3 Prove 10
 $E = 3k(1 - 2/m)$
Where E = Young's modulus
 K = Bulk modulus
 $1/m$ = Poisson's ratio
- 4 Prove the relation 10
 $m/I = \sigma/y = E/R$
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
 R = Radius of curvature
- 5 A cantilever beam AB, 2m long carries a uniformly distributed load of 1.5kN/m over a length of 1.6m from the free end. Draw the shear force diagram and bending moment diagram for the beam. 10
- 6 A cylindrical shell of 1.3m diameter is made up of 18mm thick plates. Find the circumferential and longitudinal stress in the plates, if the boiler is subjected to an internal pressure of 2.4MPa. Take efficiency of the joints as 70%. 10
- 7 A rectangular beam 60mm wide and 150mm deep is simply supported over a span of 6m. If the beam is subjected to central point load of 12KN. Find the maximum bending stress induced in the beam section. 10

Th3 Engineering Material

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. Classify the engineering material.
 - b. Give two examples of each of ferrous and non-ferrous materials.
 - c. Define crystal and ideal crystal.
 - d. What is an alloy?
 - e. Name the various heat treatment processes.
 - f. What is meant by thermosetting polymers?
 - g. Write the purpose of heat treatment process.
 - h. What is point defect?
 - i. What is elastomer?
 - j. What is dislocation?
2. Answer **Any Six** Questions 6 x 5
 - a. Write down the difference between Edge dislocation and Screw dislocation.
 - b. Differentiate between thermosetting and thermoplastic polymers.
 - c. Give a brief classification of ceramics and write down their uses.
 - d. State the composition and properties of Duralmin and Y-alloy.
 - e. Differentiate between slip and twinning.
 - f. Briefly explain the cooling curves for a material with a neat diagram.
 - g. What is effect of various alloying elements such as Cr, Mn, Ni,V and Mo?
3. Explain the iron carbon equilibrium diagram with salient micro constituents of iron and steel with a neat diagram. 10
4. Describe in detail the composition, properties and uses of tin based bearing material. 10
5. Explain in brief the following heat treatment processes: 10
 - (i) Annealing
 - (ii) Hardening
6. Explain various mechanical properties of engineering materials. 10
7. Describe in detail the composition, properties and use of a copper base spring material. 10

Th-4 Thermal Engineering-I

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 do you understand by an ideal gas?
 - b. Define thermodynamics.
 - c. Classify IC engines according to the type of fuel used.
 - d. What is the significance of octane number in IC engine fuels?
 - e. Differentiate between intensive and extensive properties.
 - f. Define the calorific value of fuel.
 - g. Define a Heat Engine.
 - h. What is meant by compression ratio in an IC engine?
 - i. State the Zeroth Law of thermodynamics.
 - j. Define thermal efficiency.
2. Answer **Any Six** Questions 6 x 5
 - a. Explain Carnot Cycle.
 - b. In a heat engine, the temperature of the source and sink are 650°C and 60°C respectively. The heat supplied is 4.5 MJ/min. Find the power developed by the engine.
 - c. Differentiate between Octane number and Cetane number.
 - d. Discuss about the limitations of First Law of Thermodynamics.
 - e. Explain the working of a four stroke engine.
 - f. Prove $C_p - C_v = R$.
 - g. Explain the quasi-static process.
3. Explain the diesel cycle with the help of p-V and T-S diagram and derive an expression for the ideal efficiency of a diesel cycle. 10
4. An engine uses 6 kg of fuel per hour of calorific value 41000 kJ/kg. If I.P. of the engine is 21 kW and mechanical efficiency is 82%. Calculate, i) indicated thermal efficiency, ii) brake specific fuel consumption and iii) Brake thermal efficiency. 10
5. Discuss in the detail about Point function & Path function. Differentiate between them. 10
6. Compare a SI engine with a CI engine. 10
7. Show the equivalence of two statements of 2nd Law of thermodynamics. 10

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Th-5 Environmental studies

Full Marks: 80

Time- 3 Hours

Answer any five Questions including Q No.1& 2
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1. Answer **All** questions 2 x 10
 - a. Define natural resources.
 - b. Write down two examples of non-renewable resources.
 - c. Define soil erosion.
 - d. Define producers in eco system.
 - e. What is bio diversity?
 - f. What do you mean by poaching of wild life?
 - g. What is the unit of sound intensity?
 - h. What is endangered species.
 - i. Define greenhouse effect.
 - j. What are the various objectives of family welfare programme.

2. Answer **Any Six** Questions 6 x 5
 - a. What are the environmental effects of mining?
 - b. Give a brief description of man wild life conflict.
 - c. What are the effects of acid rain.
 - d. Define rainwater harvesting? State the objective of rain water harvesting?
 - e. Describe about Bio gas plant.
 - f. Write down the role of an individual protecting environment.
 - g. What are the effects of modern agriculture?

3. Define Global warming, write down the causes and effect of global warming. 10
4. Explain sources of solid waste and solid waste management. 10
5. Describe aquatic ecosystem. 10
6. Write down the effect, prevention and control of noise pollution. 10
7. Write short notes on 10
 - a. Pyramid of energy
 - b. Green house effect