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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E. **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 21ME1ESEME / 21ME2ESEME **Max Marks: 100**
Course: Elements of Mechanical Engineering **Date: 18.05.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

MODULE - I

1	a)	Explain the working of a wind Turbine with a simple sketch.	**04**
	b)	Draw a labeled T-h diagram related to the formation of steam and define the following terms: Specific volume, Amount of superheat, Enthalpy of dry steam, External work of evaporation, and internal latent heat.	**08**
	c)	Identify the hydraulic turbine which has a radial flow reaction turbine and explain the construction and working the same with a neat sketch (Any one view is sufficient).	**08**

OR

2	a)	Explain with a sketch, how a parabolic type of collector is used in solar energy conversion.	**04**
	b)	Illustrate a mechanical device that is used for lifting water from the sump to the overhead tank.	**08**
	c)	Identify the turbine working on the impulse force and explain the same with a neat diagram.	**08**

MODULE - II

3	a)	Identify and explain the material that regains shape on heating. List at least two application	**05**
	b)	Illustrate the principle of the MIG welding process stating its application.	**06**
	c)	Explain the modes of heat transfer with its governing equation.	**09**

OR

4	a)	Explain the application of heat transfer in automobile radiators with the help of a simple sketch.	**05**
	b)	Explain the arc welding process with a simple sketch. List five differences between arc welding and soldering processes.	**10**

c) Identify the smart material which generates electric power on application of load and explain the same. **05**

MODULE - III

5 a) Explain the thermodynamic and physical properties of an ideal refrigerant. **06**

b) What is a SI engine? With the help of line diagrams, explain the working of a four-stroke petrol engine. Also, draw the P-V diagram. **10**

c) The following readings were taken on a four-stroke IC Engine; **04**
Diameter of brake drum= 1.5 m, Diameter of the rope= 10 mm, Load suspended on the brake drum= 100 kg, Spring balance reading = 5 kg, Crankshaft speed= 200 rpm. Determine the brake power of the engine.

OR

6 a) With a block diagram explain the working of an hybrid electric vehicles. **05**

b) Define Ton of refrigeration and COP. Describe with a neat sketch the working of vapour compression refrigerator. **10**

c) A 4-cylinder 4-stroke petrol engine develops 26 kW brake power at 2200 rpm. The mean effective pressure is 700 kPa and the mechanical efficiency is 87%. Determine the bore diameter and stroke of the engine if stroke length is 1.5 times the bore. **05**

MODULE - IV

7 a) Two pulleys are connected by a cross belt drive. The velocity ratio of the drive is 3. The driving pulley runs at 1000 rpm and of 120 cm in diameter. Find the following: **06**

i. The speed and diameter of the driven pulley,
ii. The speed the of driven pulley considering the 5 mm thickness of the belt, and
iii. The linear velocity of the belt considering the thickness of the belt.

b) A simple gear train is made up of four gears A, B, C, and D having a number of teeth 20, 40, 60, and 70, respectively. If gear A is the main driver rotating at 500 rpm in a clockwise direction, calculate the following: **08**

i. Speed of the intermediate gears
ii. Speed and direction of the follower
iii. Velocity ratio and train value of the gear train

c) Illustrate jointed arm robot configuration and mention its application **06**

OR

8 a) A compound gear train is formed by four gears 1, 2, 3, and 4. Gear 1 meshes with gear 2; and gear 3 meshes with gear 4. Gears 2 and 3 are compounded. Gear 1 is connected to the driver shaft and gear 4 is connected to the driven shaft and rotates in a clockwise direction. The number of teeth on 1st, 2nd, 3rd, and 4th gears are 24, 64, 44, and 78, respectively. If gear 4 rotates at 77 rpm. Represent the gear arrangement schematically and calculate the following: **08**

i) Speed of the intermediate gears
ii) Speed and direction of the gear 1
iii) Velocity ratio and train value of the gear train

b) Illustrate polar robot configuration and mention its application **06**

c) What is the Mechanisms and List some of the applications of linear motion and Oscillatory motion **06**

MODULE - V

9 a) Explain with a block diagram, the parts of CNC Machine. **08**

b) Which lathe operation can be used for producing conical surface on a work piece? Explain the method of tail stock offset. **06**

c) Explain closed loop control system with an example. **06**

OR

10 a) Explain the working principle of milling and drilling machine. **06**

b) Sketch and explain the following lathe operations: **08**
i) To generate serrated surfaces
ii) To reduce work piece to cylindrical section of required diameter

c) List any six advantages of CNC. **06**

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