Question Paper

Exam Date & Time: 27-Apr-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. (MAKEUP) EXAMINATIONS - APRIL 2023
SUBJECT: MIE-1071 / MME -1051 - BASIC MECHANICAL ENGINEERING
(REGULARS - LATE ADMISSION BATCH)

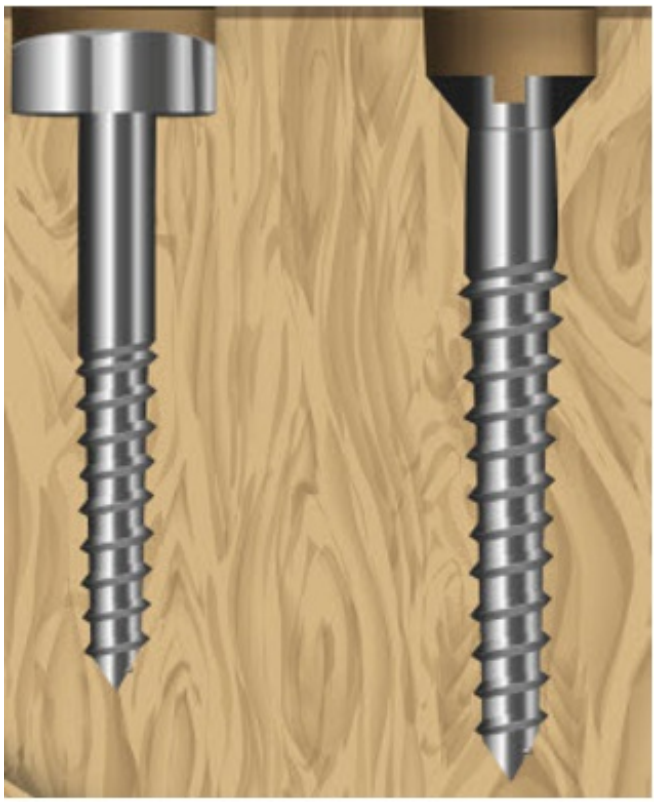
Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1A)	30 kg of steam at a pressure of 125 bar and 500°C is generated in a boiler. Calculate the amount of superheat and the degree of superheat. This steam loses 20822 kJ of heat to the surroundings at constant pressure. Find the quality of steam after heat loss.	(4)
1B)	Three boilers supply steam into a common main. The pressure in the boilers and the main is 15 bar. Boiler A which is equipped with a superheater produces 2 kg of steam with a temperature of 300°C. Boiler B is also equipped with a superheater and produces 15 kg of steam with a temperature of 350°C. Boiler C does not have a superheater and it produces 3 kg of steam. The temperature of steam in the mains is 250°C. Determine the quality of steam produced by Boiler C.	(3)
1C)	Give Reasons for the following: i) Fire tube boilers are safe to operate compared to the water tube boilers. ii) Boiler mountings are mandatory and form integral part of the boilers. iii) To run the steam turbines in power plants the steam needs to be mandatorily superheated.	(3)
2A)	A 15 cm wide flat belt transmits power from pulley 'A' rotating at 300 rpm to pulley 'B' with a speed ratio of 2:1. The sum of diameters of the pulleys is 1200 mm and the center distance between the two shafts is 2 meters. If the angle of contact is spread over $(13/24)^{th}$ of circumference on the smaller pulley, determine the power transmitted by the drive and the length of the belt. The coefficient of friction is 0.3 and the maximum tension in the belt should not exceed 15 N/mm width of belt.	(4)
2B)	A compound gear train consists of 6 gear wheels A, B, C, D, E and F. A is the driver gear and F is the driven gear having 63 and 45 teeth respectively. Gear A meshes with gear B and gears B and C are integral and concentric. Gear C has 120 teeth and meshes with gear D. Gears D and E are integral and concentric and gear E meshes with gear F. The speed reduction ratio from A to F is 27 and the speed reduction from A to B is equal to the speed reduction from C to D and E to F. Determine the number of teeth for gears B, D and E.	(3)
2C)	Differentiate open belt drive from a crossed belt drive by listing 3 points each.	(3)
3A)	The following data refers to a twin cylinder IC engine not generating power in alternate revolution of the crank shaft. Total cylinder volume of the engine=2.2 litres, Number of cycles per half revolution=1400, Mean effective pressure= 0.48 MPa, Fuel consumption=700cc per kW per hour, Power output=15kW per litre of cylinder stroke volume, Density of fuel= 780kg/m^3, Calorific value of the fuel= 39000kJ/kg, Compression Ratio=11:1. Determine indicated thermal efficiency.	(4)
3B)	Explain the working of an engine fitted with a carburettor, a smaller flywheel, piston-controlled ports and operating on isochoric heat addition and heat rejection processes.	(3)
3C)	Justify the following statements:	(3)

i) 2 stroke engines are more polluting compared to 4 stroke engines.
ii) IC engines can never have a zero-clearance volume.

4A) The following figures show the two threaded screws inserted in a wooden workpiece. Once screw has a flat head while the other has a conical head. Identify and explain with neat sketches the major machining operations required to generate the holes so as to fit these screws in their respective holes. (4)



4B) With neat sketch and labelling, explain the various parameters used for defining the specification of lathe. (3)

4C) Briefly describe the features of CNC control system. (3)

5A) Explain the composition of molding sand used in casting process. (4)

5B) Describe a suitable metal joining process with neat sketch and labelling which is used to join two thin plates at specific discrete locations at the interface. (3)

5C) Elaborate the various components of NC machine. (3)

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