Question Paper

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

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. EXAMINATIONS - JANUARY 2023
SUBJECT: MIE 1071 / MIE-1071 - BASIC MECHANICAL ENGINEERING

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

Answer all the questions.

1A)	60 kg of steam at a pressure of 70 bar and at a temperature of 310°C is generated in a boiler. Calculate the amount of superheat and the degree of superheat. This steam loses 66170 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 boiler and the mains is 25 bar. Boiler A which is equipped with a superheater produces 2 kg of steam at a temperature of 300°C. Boiler B is also equipped with a superheater produces 9.16 kg of steam at 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 270°C. Determine the quality of steam produced by Boiler C.	(3)
1C)	Give Reasons for the following: a) Cooking requires more time on the summit of Mt. Everest. b) Feed check valve is a non-return valve. c) Boiler accessories are not fitted directly on the boiler.	(3)
2A)	A washing machine makes use of a motor running at 1300 rpm to rotate its drum. An open flat belt drive transmitting power to the drum with a speed reduction ratio of 4 has the larger pulley as 450 mm. The belt drive transmits 3 kW of power with the coefficient of friction between the belt and pulley surface as 0.12 while the center distance between the pulleys is fixed at 0.5 m. If the permissible tension in the belt is to be limited to 10 N per mm, determine the belt specifications.	(4)
2B)	A compound gear train consists of 8 gear wheels A, B, C, D, E, F, G and H. A is the driver gear and H is the driven gear having 90 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. Gear E has 60 teeth and meshes with gear F. Gears F and G are integral and concentric and gear G meshes with gear H. The speed reduction ratio from A to H is 81 and the speed reduction from A to B is equal to the speed reduction from C to D, E to F, F to G and G to H. Determine the number of teeth for gears B, D, F and G.	(3)
2C)	With a simple schematic diagram explain the type of gear used for the following conditions: i) Driver and driven shafts are non-parallel and non-intersecting. ii) Driver and driven shafts are inclined and intersecting.	(3)
3A)	A single cylinder diesel engine has a volume capacity of 0.1 litre when the piston is at TDC position and generates power in alternate revolution of crank shaft. The compression ratio is 16, the number of power strokes per minute is 250 and the mean effective pressure is 7200 kPa. If the load on brake drum is 110 kg and its diameter is 110 cm, calculate the power generated inside the engine cylinder. What will be the percentage conversion of combustion heat to useful output power if the engine is found to consume 22 cc of fuel in 12 seconds? The specific gravity of fuel is 0.7, density of standard fluid is 1000 kg/m3 and calorific value is 43MJ/kg. Also find the mechanical efficiency?	(4)
3B)	A CI engine in which the cam shaft speed is half that of crank shaft speed is used to generate power. With neat sketches, explain its operation.	(3)
3C)	With neat sketch, explain the operation of simple carburettor used in an IC engine.	(3)

4A)	Workpiece is held between centers on an engine lathe and a small taper angle is to be cut on a long workpiece. Explain with sketch the suitable taper turning method to achieve this objective.	(4)
4B)	Give reasons for the following: i) Compound rest is provided with a circular graduated base. ii) Guideways are provided on top of the lathe bed. iii) The centre mounted on the tailstock is called as dead center.	(3)
4C)	What are the benefits of implementation of Automation? List six points.	(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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