Question Paper

Exam Date & Time: 01-Dec-2018 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLED SCIENCES
II SEMESTER B.S. ENGINEERING END SEMESTER EXAMINATION- NOVEMBER/DECEMBER 2018

Basic Mechanical Engineering [ME 123]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

Any missing data if any, may be suitable assumed.
Use of steam table is permitted

1) A) A boiler that operates at 25 bar pressure produces dry saturated steam. This steam loses 100 kJ/kg of heat while travelling to the super heater. Inside the superheater its temperature is increased by 150Â°C. The superheated steam produced is then used to partially heat the feed water (initially at 0Â°C) before being sent to a turbine. The heat transferred from the superheated steam to the feed water is 100 kJ/kg. Assuming no losses. Determine the following
a) Dryness fraction of the steam entering the super heater
b) Quality of steam after heating the feed water
c) Temperature of feed water entering the boiler
d) Amount of heat supplied to feed water in the boiler
Take C_{pw} = 4.18 J/g K and C_{ps} = 2.25 J/g K.
Also draw the temperature-enthalpy diagram for the above process (10)

B) Sketch and explain the working of vapour compression refrigeration system (10)

2) A) Explain the working principle of reaction steam turbine. Draw the propelling force diagram and also show the pressure-velocity changes (7)

B) Explain the differences between:
i) Open and crossed belt drive
ii) Spur and helical gear
iii) Simple and compound gear train (8)

	C)	With block diagram explain the construction of radial drilling machine	(5)
3)	A)	Draw the schematic diagram of thermal power plant. Label all the parts and explain the working principle.	(8)
	B)	Draw a neat sketch of simple carburetor and explain how it works	(7)
	C)	From a test on a four stroke petrol engine, the following data is available: engine speed 1000 rpm, net brake torque 70 N.m, indicative mean effective pressure 10 bar, stroke 150 mm, bore 100 mm, rate of fuel consumption 2.57 kg/h, CV of petrol 41000 kJ/kg. Calculate the indicated thermal efficiency, brake thermal efficiency and mechanical efficiency	(5)
4)	A)	Explain the differences between: i. Engine lathe and Capstan & Turret lathe ii. Drilling and boring iii. Turning and thread cutting	(6)
	B)	Explain the desirable properties of a good molding sand	(9)
	C)	What are the objectives of heat treatment? Explain annealing and normalizing.	(5)
5)	A)	A compound gear train consists of six gear wheels A, B, C, D, E & F. A is the driver gear and F is the driven gear having 100 and 16 teeth respectively. Gear A meshes with gear B and gear B & C are mounted on the same shaft. Gear C has 80 teeth and meshes with gear D. Gears D & E are mounted on the same shaft and gear E meshes with gear F. The velocity ratio from gear A to F is 64 and the velocity ratio from A to B is equal to the velocity ratio from C to D and E to F. Determine the number of teeth for gears B, D & E. If the circular pitch of the gears is 2π determine the centre distance between the driver and driven shafts.	(7)
	B)	An engine is driving a generator by means of an open belt drive. The pulley on the driving shaft is 60 cm in diameter and that on the driven shaft is 30 cm. The center distance is 3m.The coefficient of friction of the material of the belt is 0.3. The engine runs at 500RPM. The maximum permissible tension in the belt is 2000 N, Calculate the following. i) Linear velocity of the belt.	(5)

ii) Length of the belt.
iii) Power Transmitted.

C) Draw the schematic of gas welding set-up. Also sketch and explain the different types of gas welding flames. (8)

6) A) With sketches explain the working of I.C engine, wherein heat addition takes place at constant pressure and power is generated every alternate rotations of the crank shaft (10)

B) Draw a neat and labelled sketch of Babcock and Wilcox boiler. What are the advantages and disadvantages of water tube boiler over fire tube boiler? (10)

7) Sketch and explain the two box molding process (8)

A)

B) State the purposes of lubrication. Discuss the properties of an ideal lubricant (6)

C) Sketch and explain lathe specifications. (6)

8) A) Differentiate between brazing and soldering. Also explain soft and hard soldering. (4)

B) Give the classification of prime movers. Sketch and explain the working principle of gas turbine (6)

C) With neat and labelled diagram explain the following: (10)
i) Stepped cone pulley
ii) Fast and loose pulley

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