Sub - MQE

Q.P. Code : 561400

(3 Hours) **[Total Marks : 80**

N B:

1. Question Number 1 is compulsory
2. Attempt any three questions from remaining
3. Draw suitable sketch to justify explanation and assume suitable data if required.

Q 1	A]	Distinguish between Line Standard and End Standard	[5]
	B]	Compare Pneumatic and Mechanical Comparator	[5]
	C]	Explain Taylor's Principal of Gauge Design also Types of Fits	[5]
	D]	Explain Waviness and Roughness	[5]
Q 2	A]	Explain the principal construction of Parkinson's Gear Tester	[10]
	B]	Explain the different Elements of the Surface Roughness	[10]
Q 3	A]	Explain Two Wire method used in Screw Thread Measurement	[10]
	B]	Explain Pitter Gauge Interferometer	[10]
Q 4	A]	Explain types of Cost of Quality with suitable example	[10]
	B]	What are the objective of quality control	[10]
Q 5	A]	Explain use of X bar and R charts in quality control	[10]
	B]	Define " Control Chart " state objective of control chart for variables	[10]
Q6		Write short notes on any four	[20]
	A]	Tooth thickness measurement	
	B]	SQC tools	
	C]	Tool Maker Microscope	
	D]	Acceptance sampling	
	E]	Consumers Risk and Producers risk	

TE SEM - V AUTO ERegs

HT / MECH AUTO / SEM V / CBGS

19-12-16

Q. P. Code : 600902

Sub :- HT

[3 Hours]

[Total Marks:80

Notes: 1) Question no.1 is **compulsory.**
2) Attempt any **THREE** from questionno.2 to 6.
3) Use illustrative diagrams wherever possible.
4) Use of Steam table is permitted.
5) Assume suitable data wherever required

1. Solve any **Four** :- 20

a) Draw a neat boiling curve for water and mark the different boiling regimes.

b) A steel ball 50mm in diameter and at 900^{0}C is placed in still atmosphere of 30^{0}C.Calculate the initial rate of cooling of the ball in ^{0}C/min.
Take ρ = 7800 kg/m^3 , C = 2 kJ/kg^{0}C(for steel), h=30W/m^2 ^{0}C. Neglect internal thermal resistance .

c) Explain non dimensional numbers used in convection heat transfer.

d) Explain briefly the term thermal capacity and thermal diffusivity of material.

e) Define intensity of radiation. What is a solid angle? What is its unit?

2. a) A wall of a furnace is made up of inside layer of silica brick120 mm thick covered with a layer of magnesite brick 240 mm thick. The temperature at inside surface of silica brick wall and outside surface of magnesite brick wall are 725°C and 110°C respectively. The contact thermal resistance between the two walls at the interface is 0.0035°C/W per unit wall area. If thermal conductivities of silica and magnesite bricks are 1.7W/m°C and 5.8 W/m°C, calculate. 10

(i) The rate of heat loss per unit area of walls.

(ii) The temperature drop at interface.

b) Derive the formula for rate of heat transfer for an insulated tip fin from the differential equation 10

$$\frac{d^2\theta}{dx^2} - m^2\theta = 0$$

3. a) Air at 30^{0}C flows with a velocity of 2.8 m/s over a plate 1000 mm (length) X 600 mm (width) X 25mm (thickness). The top surface of the plate is maintained at 90^{0}C. If the thermal conductivity of the plate material is 25 W/m^{0}C, calculate: i) heat lost by the plate; ii) bottom temperature of the plate for the steady state condition. The thermo – physical properties of air at mean file temperature at 60^{0}C are ρ = 1.06 kg/m^3, k = 0.02894 W/m^{0}C, C_p= 1.005 kJ/kg^{0}C, Pr = 0.696; ν = 18.97x10^{-6} m^2/s. Choose the appropriate relation from the following: 10

$\overline{Nu} = 0.664\ (Re_L)^{1/2}\ (Pr)^{1/3}$ – For Laminar flow;

$\overline{Nu} = 0.036\ (Re_L)^{0.8}\ (Pr)^{1/3}$ – For Turbulent flow

b) With the help of dimensional analysis method prove that for free convection 10

Nu=constant x $(Gr.)^m$ x$(Pr.)^n$

[TURN OVER

4. a) State and explain the reciprocity theorem. Derive the equation $A_1 F_{1-2} = A_2 F_{2-1}$. 10
   b) An electric wire of 0.25mm diameter ,ε=0.4 is placed within a tube of 2.5 mm diameter, ε=0.6 having negligible thickness.This tube in turn is placed concentrically within a tube of 5 mm diameter , ε=0.7.Annular spaces can be assumed to be evacuated completely. If the surface temperature of the outer tube is maintained at 5°C, what must be the temperature of wire so as to maintained the temperature of inner tube at 120°C? 10

5. a) Derive the expression for log mean temperature difference in a counter flow heat exchanger. State your assumption. 08
   b) In a certain double pipe heat exchanger hot water flows at the rate of 50000 kg/hr and gets cooled from 95°C to 65°C. At the same time 50000 kg/hr of cooling water at 30°C enters the heat exchanger. The flow conditions are such that overall heat transfer coefficient remains constant at 2270W/m²K.Determine the heat transfer area required and the effectiveness, assuming two streams are in parallel flow. Assuming for the both streams C_p = 4.2 kJ/kg K. 08
   c) Explain Heat Exchangers effectiveness. 04

6. a) Write short note on **any Two** of the following - 08
      i) Heisler Chart.
      ii) Explain efficiency and effectiveness of fin.
      iii) Time constant of thermocouple.
   b) Explain Hydrodynamic and thermal boundary layer. 04
   c) A steel rod (K= 32 W/m°C), 12 mm in diameter and 60 mm long, with an insulated ends to be used as spine. It is exposed to surroundings with a temperature of 60°Cand a heat transfer coefficient of 55 W/m²°C. The temperature at the base of the fin is 95°C. Determine- 08
      (i) The fin efficiency;
      (ii) The temperature at the edge of the spine;
      (iii) The heat dissipation.

HMT) MECH& AUTO) Sem V / OLD
19-12-2016

Q.P. Code : 599700

8wb - HMT **(3 Hours)** **[Total Marks : 100]**

N.B.: 1) Question No.1 is compulsory
2) Answer any 4 from the remaining.
3) Assume suitable data if necessary.

Q-1 Answer any 4 questions. **[20]**

a) What are the three modes of heat transfer? Define each one of them.
b) How heat exchangers are classified?
c) Write a note on mechanism of dropwise and filmwise condensation.
d) What are the causes of fouling and its impact on performance of Heat Exchanger?
e) Define Wien's Displacement Law. What are its practical applications?

Q-2 a) Derive three dimensional general differential equation of heat conduction in Cartesian coordinates. **[10]**

b) A 10 cm O.D pipe carrying saturated steam at a temperature of 195°C is lagged to 20 cm diameter with magnesia and further lagged with laminated asbestos to 25 cm diameter. The entire pipe is further protected by a layer of canvas. Take the temperature under the canvas is 20°C and the thermal conductivity of magnesia and asbestos are 0.07 W/m-K and 0.082 W/m-K respectively. Neglect the thermal resistance of the pipe material. Find (i) heat transfer Rate (ii) Intermediate temperatures **[10]**

Q-3 a) What is black body? How does it differ from grey body? **[4]**

b) Draw a neat temperature v/s length profile for parallel flow HE, counter flow HE, Condenser and Evaporator. **[6]**

c) A steel pipe of 8m length and 0.15 m outer diameter lies horizontally in a large room with an ambient temperature of 30°C. The pipe surface is at 250°C and has an emissivity of 0.6. Estimate the total heat loss (due to convection and radiation) from the pipe to the atmosphere. Properties of air at film temperature : **[10]**

$\nu = 27.8 \times 10^{-6}$ m²/s, k = 0.035 W/mK, Pr = 0.684. Take $Nu = 0.53 (Gr.Pr)^{1/4}$

Q-4 a) Nitrogen gas at 0°C is flowing over a 1.2 m long, 2m wide plate maintained at 80°C with a velocity of 2.5 m/s. For nitrogen, density = 1.142kg/m³, Cp = 1.04 KJ / Kg K, kinematic viscosity (ν) = 15.63×10^{-6} m²/s and k=0.0262 W/m-K. Find heat transfer coefficient and total heat transfer from the plate. Take the correlation, **[10]**

$Nu = 0.664\ Re^{1/2} Pr^{1/3}$.

b) A solid copper sphere of 10 cm diameter (c_p = 383 J/kg K, ρ = 8954 kg/m^3, k = 386 W/m K), initially at a uniform temperature t_i = 250°C is suddenly immersed in a well stirred fluid which is maintained at a uniform temperature t_∞ = 50° C .The heat transfer coefficient between the sphere and fluid is h = 200 W/m^{2}K.Determine the temperature of copper block at an instant 5 minutes after the immersion. [10]

Q-5 a) In a counterflow double pipe heat exchanger, 10500 kg/hr of water is heated from 30° C to 80° C by superheated steam. The steam enters the heat exchanger at 180° C and leaves at 130° C. If the overall heat transfer coefficient is 814 W/m^2 K calculate (i) The rate of heat transfer and (ii) the surface area of heat exchanger. What would be the increase in area if the fluid flows were parallel? [10]

b) Derive an expression for Log Mean Temperature Difference (LMTD) in a parallel flow heat exchanger. [10]

Q-6 a) An aluminium radiation shield with an emissivity of 0.05 on both sides is placed between two large parallel plates, one at a temperature of 727° C with emissivity of 0.8 and other at a temperature of 227° C with an emissivity of 0.4.Calculate the temperature of the shield and the percentage reduction in heat transfer rate between the plates as a result of the shield. [12]

b) Define efficiency and effectiveness of fin. [4]

c) Define shape factor and State Reciprocity Theorem. [4]

Q-7 a) What are the different modes of Mass transfer? [6]

b) Define Fick's law of diffusion with description. [8]

c) Draw a neat boiling curve showing all boiling regimes of water [6]

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TE Mech & Auto Sem V CBGS PP-III 15/12/2016

BE SEM-V AUTO (CBGS)

Sub - PP - III

Q.P. Code : 600802

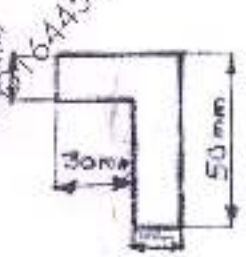
(3 Hours) **Total** Marks : 80

Note :(1) Question No.1 is compulsory and Answer 3 Questions remaining 5 Questions.
(2) Assume suitable data wherever necessary
(3) Figurers to the right indicate full marks.

1. Answer **any four** of the following. **20**
   a) What is meant by clearance applied to the cutting dies? What are the factors affecting it?
   b) Write the principles of pin locations.
   c) Explain principle and working of LASER beam machining.
   d) What is high speed machining? Write the requirements of high speed machining.
   e) How presses are classified?

2. a) Symmetrical cup of diameter 60mm and length 60mm and corner radius 1.5mm is to be drawn from cold rolled steel sheet of thickness 1.5mm. Calculate the blank size, percentage reduction, no. of draws, punch and die radius, clearance and drawing pressure. Ultimate tensile strength=440N/mm^2, C=0.7 **10**
   b) Explain following principles for the design of jigs and fixtures. **10**
      i) fool proofing ii) ejectors iii) clearance

3. a) What is strip layout? Write factors affecting strip layout? Prepare economical strip layout for the component shown in figure from the sheet of 400mm X1200mm. **10**



   c) Explain with neat sketch use of diamond pin. **05**
   d) Explain any two types of quick acting clamps. **05**

4. a) With the help of neat sketch explain the hot runner mold. Also write its applications, advantages & limitations. **10**
   b) Explain the principles and working of electro-discharge machining with neat sketch. What are the functions and requirements of di-electric fluids? **10**

[TURN OVER]

5	a)	Explain use of setting block and ten non in the design of milling fixtures.	7
	b)	With the help of neat sketch explain two piate molds.	7
	c)	What arc automatic machines? Write its classifications.	6
6	a)	Explain principle and working of ultrasonic machining. List the abrasive used in USM. Also write its applications.	10
	b)	With the help of conceptual model illustrate the concept and enables of agile manufacturing.	10

F 60 / MECH & AUTO / IV / OLD

03-12-16

Q. P. Code : 599600

(3 Hours) [Total Marks: 100]

N.B.: (1) Question No.1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Figures to right indicate full marks.
(4) Assume suitable data if necessary and justify the same.

1. Answer the following : 20
(1) How fluids are classified? Represent different types of fluid on shear stress Vs velocity gradient plot.
(2) Streamline body and bluff body
(3) Explain Moody's chart
(4) Given the velocity field : $V = (6 + 2xy + t^2)i - (xy^2 + 10t)j + 25k$. What is the acceleration and velocity of a particle at (3,0,2) at time t = 1?

2. (1) Using the laminar boundary layer velocity distribution: 10

$$\frac{u}{U_\infty} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

obtain an expression for Boundary layer thickness, Shear stress in term of Reynold number.
(2) What is CFD? Explain CFD simulation? State its applications. 06
(3) Explain conditions of stability of floating and submerged bodies 04

3. (1) Derive an expression for total pressure and centre of pressure for a vertically immersed surface. 10
(2) State and explain the Prandtl mixing length hypothesis and derive an expression for turbulent stresses. 10

4. (1) In a vertical pipe conveying oil of specific gravity 0.8, two pressure gauges have been installed at A and B where the diameters are 16 cm and, 8 cm respectively. A is 2 m above B. The pressure gauge readings have shown that the pressure at B is greater than at A by 0.981 N/cm^2. Neglecting all losses, calculate the flow rate. 10
(2) If the velocity field is given by $u = x^2 - y^2 + x$ and $v = -(2xy + y)$, determine φ and ψ. 10

TURN OVER

5. (1) A reducing bend is incorporated in a pipeline so that the direction of flow is turned through 60° in the horizontal plane and the pipe diameter is reduced from 0.25 m to 0.15 m. The velocity and pressure at the entry to bend are 1.5 m/s and 300 kN/m² gauge respectively and at the exit the pressure is 287.2 kN/m² gauge. Find magnitude and direction of the reaction force in the bend in the horizontal plane due to the flowing water. 10

(2) Explain what is mean by separation of boundary layer and describe in detail the methods to control the same. 10

6. (1) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the distribution of velocity and shear stress across a section of the pipe. 10

(2) Three pipes of 400 mm, 200 mm and 300 mm diameters and having lengths of 400m, 200 m, and 300m, respectively are connected in series to make a compound pipe. The ends of this compound pipe are connected with two tanks whose difference of water levels is 16 m. If the friction factor f for these pipes is same and equals to 0.02, determine the discharge through the compound pipe neglecting minor losses (take coefficient of contraction Cc = 0.6). 10

7. **Explain the following terms with reference to fluids** 20

(i) Source and Sink
(ii) Circulation and Vorticity
(iii) Stream function and Velocity potential function
(iv) Rotational and Irrotational flow
(v) Laminar and Turbulent flow.

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ICE/MECH & AUTO/GBGS/ NOV-DEC 2016

IV

Q. P. Code : 600700

(3 Hours) [Total Marks : 80]

Note: i. Q.No.1 is **compulsory.**
ii. Attempt any **Three** question from Q.No.2 to Q.No.6
iii. Make suitable assumptions if required
iv. Use of Steam Table is permitted.

Q.No.1 Solve Any **Four** (5×4)

a) Indicate whether the following statements are right or wrong and, correct the wrong statements:
i. The thermal efficiency of a diesel cycle will increase with increase in cut off ratio.
ii. Higher the Octane numbers of a fuel, longer the ignition delay.
iii. Camshafts of four strokes I.C. Engines rotate at twice the speed off crankshaft.
iv. Increasing the compression ratio of a C. I. Engine will increase the knocking tendency.
v. Carbon deposits in I. C. Engine cylinder results in decrease of effective compression ratio.

b) What will be the effect on the efficiency of an Otto cycle having compression ratio of 8, if C_v increases by 1.6% C_v, specific heat?

c) What is the difference between physical delay and chemical delay? State the factors on which delay period depends.

d) Compute the bmep in bar, mean piston speed in m/s and torque in Nm for a two stroke, four cylinder C.I. Engine having following specifications bore dia.150 mm, brake power 265 kW at 2400 rpm, L/d ratio of 0.90. Also identify whether this engine is a square, over square or under square engine.

e) List out and define various engine efficiencies with their tentative values for the modern engines.

No.2 a) During an engine trial on a six cylinder four stroke diesel engine,cylinder bore 180 mm, the stroke 200 mm, the following observations were recorded : speed 1500 rpm, BP = 245 Kw , mep = 8 bar ,fuel consumption :70 kg/hr, heating valve of fuel 44 MJ/kg , Hydrogen content of the fuel 12%, air consumption 28 kg/min., mass of cooling water 85 kg/min., cooling water temperature rise 42 ^{0}C, cooling oil circulated through the engine = 50 kg/min, temperature rise of cooling oil = 24^{0}C ,specific heat of cooling oil 2.1 kJ/KgK, room temperature 30 ^{0}C, exhaust gas temperature 400 ^{0}C, Cp of the dry exhaust gas 1.045 kJ/kgK, partial pressure of the steam in a exhaust gases 0.035 bar. Estimate the mechanical efficiency and Draw of the heat balance sheet. **(15)**

b) What are the sources of HC formation in petrol engine? Explain the different factors which affect the HC formation. **(05)**

3 a) Why C.I engines exhibit more favorable fuel consumption at part load and idling, compared to the carbureted S.I engines? **(05)**

[TURN OVER]

b) Describe the phenomenon of knocking in S.I. engines with the help of P-θ and P-V plots. (05)

c) Willan's line test is conducted on a constant speed diesel engine operating at 1500 rpm and developing 50 kW power output at full load. Willan's line may be considered as a straight line up to 60% load, with the slope of the line being 8° (eight degrees). The fuel consumption for this engine is 2.46 kg/h at 10% load. Calorific Value (C.V.) of fuel used is 42 MJ/kg. Calculate (i) Frictional power (ii) Fuel consumption in kg/h at 60% load. (iii) Brake thermal efficiency at 60% load. (iv) Mechanical efficiency at 40% load. (v) Brake torque at 40% load. (10)

Q.No.4 a) Write short note on the following : **(Any Two)** (5×2
i) Air cooling ii) Wankel Engine iii) Dissociation

b) A 4- stroke cycle C.I. engine develops 11 KW per cylinder while running at 1800 r.p.m. and using fuel oil of 32 ^{0} API. Fuel injection occupies 32 ^{0}C of crank travel and takes place through a fuel injection orifice 0.47 mm diameter with a flow coefficent of 0.9. Fuel is injected at a pressure of 118.2 bar in to combustion chamber where the pressure is 31.38 bar. Estimate the quantity of fuel injected in kg/Kwh. (10)

Specific gravity of fuel oil is given by: 141.5 /(131.5 + ^{0} API)

Q.No.5 a) Write short note on the following : **(Any Two)** (2×
i) Stratified Charge Engine.
ii) Alternative Fuels for I.C. Engine.
iii) Electronic Fuel-Injection system.

b) Determine the size of fuel orifice to give A:F = 12:1. The diameter of venturi throat is 3.5 cm and the vacuum at the venturi is 6.9 cm of Hg. The pressure and temperature of atmospheric air are 1.013 bar and 25 ^{0}C. The nozzle lip = 5 mm. Take Cd_a= 0.9, Cd_f = 0.7, density of fuel 760 Kg/m^3. (10
Consider the compressibility of air.

Q.No.6 a) The average indicated power in a C.I. engine is 15 kw/m^3 of free air inducted per minute. It is a four stroke engine having swept volume 3.4 liter. The speed of the engine is 3300 rpm and has a volumetric efficiency 80% referred to free air conditions of 1.013 bar and 22^{0}C. It is proposed to provide with a blower, driven mechanically from the engine. The blower has a pressure ratio1.8 and adiabatic efficiency 75%. It can be assumed that at the end of suction, in the supercharged condition, the cylinder contain a volume of air equal to the swept volume at the pressure and temperature of delivery from the blower. Calculate the net increase in break power. Take Mechanical efficiency of engine and blower as 80%. (1

b) Explain briefly various methods to control Emission.

MQE / Auto / TE Sem V / CBGS / 28/11/16 NOV-DEC - 2016

Sub - MQE

Q.P. Code : 561400

(3 Hours) **[Total Marks : 80**

N.B.

1. Question Number 1 is compulsory
2. Attempt any three questions from remaining
3. Draw suitable sketch to justify explanation and assume suitable data if required.

Q 1	A]	Distinguish between Line Standard and End Standard	[5]
	B]	Compare Pneumatic and Mechanical Comparator	[5]
	C]	Explain Taylor's Principal of Gauge Design also Types of Fits	[5]
	D]	Explain Waviness and Roughness	[5]
Q 2	A]	Explain the principal construction of Parkinson's Gear Tester	[10]
	B]	Explain the different Elements of the Surface Roughness	[10]
Q 3	A]	Explain Two Wire method used in Screw Thread Measurement	[10]
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Q 5	A]	Explain use of X bar and R charts in quality control	[10]
	B]	Define " Control Chart " state objective of control chart for variables	[10]
Q6		Write short notes on any four	[20]
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	B]	SQC tools	
	C]	Tool Maker Microscope	
	D]	Acceptance sampling	
	E]	Consumers Risk and Producers risk	