AUTO/ V | CBSGS/ MAY/ 21-5-18

Q.P.Code : 21933

(3 Hours) Total Marks-80

NB: - 1.Question No.1 is compulsory
2. Solve any three questions from remaining five
3. Assume suitable data wherever necessary

Q.1 Answer the following questions:

a) Draw and explain various surface roughness symbols. 04
b) Compare Mechanical and Pneumatic comparators. 04
c) Distinguish between p chart and c chart. 04
d) Explain with neat diagram for GO-NOGO plug gauge, Taylor's principle of Gauge Design. 04
e) The divisions on main scale of a vernier caliper are 0.5mm apart. The vernier has 100 divisions equal in length to 98 main scale divisions. What is the accuracy of the instrument? 04

Q.2

a) Describe with neat sketch two wire method of measuring the effective diameter of screw threads? 10
b) By using optical flat and monochromatic light explain the procedure to determine i) whether the given surface is flat or curved.ii) whether the curved surface is convex or concave. 10

Q.3

a) With the help of graphical representation explain parameters R_a, R_y, R_z and sampling length used in surface texture measurement. 10
b) Define and explain various types of cost of quality with suitable examples. 10

Q.4

a) Draw the conventional diagram of limits and fits and explain the terms such as Basic Size, Upper deviation, Lower deviation, Fundamental deviation and Zero line. 05
b) Why is it necessary to give tolerance on engineering dimension? Give an example of both a unilateral and bilateral tolerance. 05
c) Explain with neat sketch working of Tool Makers Microscope. 10

Q.5

a) Describe the Parkinson's Gear tester with neat labeled diagram and state its limitations. 10
b) Compare X bar chart with R charts. Discuss the circumstances in which either of the two or a combination of these will be used for purpose of control. 10

Q.6

a) Explain various types of sampling plans which are in practice in industry with their respective acceptance criteria. 10
b) Explain the Operating Characteristic curve with reference to sampling inspection. Also show various regions in the same with their suitable meaning. 10

MECH & AUTO/ V / CBSGS/ ICE / 25-5-18

Q. P. Code: 39559

Time: 3 Hours **Marks: 80**

Note: 1. Q.No.1 is **compulsory.**
2. Attempt any **Three** question from Q.No.2 to Q.No.6
3. Make suitable assumptions if required

Q.No.1 Solve Any **Four** (5*4)

a) 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.

b) Why C.I engines exhibit more favorable fuel consumption at part load and idling, compared to the carbureted S.I engines?

c) What is mean by opposed type and radial type engine?

d) The diameter and stroke length of a single two stroke engine working on the constant volume cycle are 100 mm and 200 mm respectively with clearance volume 2.75 liters. When the engine is running at 120 rpm the indicated mean effective pressure was 5bar and gas consumption 2.5 kg/hr. If the calorific value of the gas used is 16350 kJ/kg.

Find: (i) Air standard efficiency
(ii) Indicated power developed by the engine and
(iii) Indicated thermal efficiency of the engine.

e) State the difference between ignition timing and firing order.

Q.No.2 a) The following observations were recorded in a test of one hour duration on a single cylinder oil engine working on four-stroke cycle and engine is fitted with rope brake: **(14)**

Bore = 150 mm; Stroke = 300 mm; Fuel used = 2.4 kg; Calorific value of fuel = 42000 kJ per kg; Average speed = 300 rpm; Indicated mean effective pressure = 7 bar; The dead load on the engine = 360 N; Spring balance reading = 30 N; Quantity of cooling water = 300 kg; Temperature rise of cooling water = 35 °C; Diameter of the brake wheel = 1.2 m, Air used = 52.8 kg; Temperature of air in test room = 20 °C; Temperature of exhaust gases = 410 °C; Cp (gases) = 1 kJ/kg K; Atmospheric Pressure = 1.013 bar, Calculate:

(i) Indicated Power
(ii) Brake thermal efficiency.
Draw the heat on minute and percentage basis.

b) Justify the requirement of air motion and swirl in a C. I. Engine combustion chamber is much more stringent than in an S. I. Engine. **(6)**

Q.No.3 a) Describe with suitable sketches the combustion phenomenon in SI engine. Explain the three phases of combustion. Discuss the effect of engine variables on ignition Lag. **(10)**

b) State the reasons for efficiency of actual cycle is much lower than the air standard cycle efficiency? List the major losses and differences in actual engine cycle and air standard cycle. **(10)**

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Q.No.4 a) Explain how supercharging helps to improve the power output. What are its limitations

b) The following data relate to a four-stroke cycle petrol engine of Hindustan Ambassador: Capacity of the petrol engine = 1489 C.C., Speed at which maximum power is developed = 4200 RPM, The volumetric and efficiency (at the above speed) = 75%, The air-fuel ratio = 13 : 1, Theoretical air speed at choke (at peak power) = 85 meter per sec., The Coefficient of discharge for venturi $C_{da} = 0.82$, The Coefficient of discharge for the main petrol jet $C_{da} = 0.65$, The specific gravity of petrol = 0.74, Level of petrol surface below the throat = 6 mm, Atmospheric pressure and temperature = 1.013 bar and 20°C respectively. An allowance should be made for the emulsion tube, the diameter of which can be taken as 40% of the choke diameter. Calculate the, sizes of a suitable choke and main jet.

c) Describe with neat sketches the working of Wankel Engine.

Q.No.5 a) Differentiate **(Any Two)**

i) Scavenging and Supercharging. ii) Wet sump and Dry sump lubrication.
iii) Water cooling and Air cooling

b) Determine the Air-Fuel Ratio (A/F) and percentage richness supplied at 4 km altitude by a carburetor, which is initially adjusted to give 10% lean mixture at sea level. The ambient conditions at sea level are 27 °C and 1 bar. Assume that the temperature of air decreases with altitude given by
$t = t_S - 0.00675\ h$, where, h is height in meters and t is sea level temperature in °C. The air pressure decreases with altitude as per the relation
$\mathbf{h = 19{,}000 \log_{10}(1/P)}$ where P is in bar. State any assumptions made.

Q.No.6 a) An air compressor is being run by the entire output of a supercharged 4-stroke cycle diesel engine. Air enters the compressor at 25°C and is passed on to a Cooler where 1210 kJ per mm is rejected. The air leaves the cooler at 65°C and 1.75 bar. Part of this air-flow is used to supercharge the engine which has a volumetric efficiency of 72% based on induction manifold condition of 65°C and 1.75 bar. The engine, which has six cylinders of 100 mm. bore and 110 mm stroke runs at 2000 rpm and delivers an output torque of 150 Nm. The mechanical efficiency of engine is 80%.
Evaluate:—
(i) The indicated mean effective pressure of the engine;
(ii) The air consumption rate of the engine;
(iii) The air-flow into compressor in kg per min.

b) What is vapors lock? How is it related with ASTM distillation curve of the fuel?

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Mech/Auto/ Sem V/ CBSGS / PP III / 31/05/18

Q. P. Code: 37939

Time : 3 hours **Marks: 80**

Note
1. All questions carry equal marks.
2. Question number one is compulsory.
3. Solve any three questions from remaining questions.
4. Assume suitable data if necessary.

Q.1 Answer **any four** of the following. 20

i) What is high speed machining? What are the requirements of high speed machining?

ii) Write short note on flexible manufacturing system.

iii) Explain general arrangement of two plate injection mould.

iv) Write the difference between jigs and fixtures.

v) Why pilots are used on progressive die? Explain types of pilot.

vi) Explain principle, advantages and limitations of laser beam machining.

Q.2 a) Explain following design principles used to jigs and fixtures. 10

i) Fool proofing

ii) Burr grooves

iii) Ejectors

b) What is indexing? Explain any one type of indexing jig with neat sketch. 10

Q.3 a) Why jig should have four feet not three? 05

b) Write the design principles used for the turning fixtures. 05

c) What is clearance on cutting dies. What are factors affecting clearance? 05

d) What do you mean by bending allowance? Write the factors affecting it. 05

Q. 4 Write short note on the following.

i) Strip layout 05

ii) Double action redraw die. 05

iii) Explain various methods of reducing cutting force in cutting die. 05

iv) With the neat sketch, explain the principle and working of abrasive jet machining. 05

Q.5 a) With neat sketch explain feed system. What is the balanced feed system? Also write factors affecting runner size. 10

b) What is ejection system? List ejection techniques and explain any one of them with neat sketch. 10

Q.6 a) What is agile manufacturing? Also write enablers of agile manufacturing. 10

b) Explain with neat sketch, principle, working, advantages, limitations & applications of EDM. 10

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Mech / Sem V / CBSGS / Old to CBSGS / HT / 06/06/18

Q. P. Code: 39556

Time: 3 Hours **Marks: 80**

Note: - (1) Question No. 1 is compulsory
(2) Answer any Three out of remaining Five
(3) Make suitable assumption, if necessary

Q1. Solve any Five (5*4)

a) A steam pipe is insulated to reduce the heat loss. However, the measurement reveal that the rate of heat lost has increased instead of decreasing .Can you comment why?

b) Two pin fins are identical except that the diameter of one is twice that of other. For which fin will (i) Fin Effectiveness (ii) Fin Efficiency be higher?

c) What is lump system analysis? What are the assumptions made in the lumped system analysis and when is it applicable?

d) When heat transfer through a fluid layers is by conduction and when it is by convection? For what case, the rate of heat transfer is higher?

e) What are the limitations of LMTD method? How is Effective – NTU method superior to LMTD method?

f) Explain Thermal Contact Resistance.

Q.2 a) Derive Fourier's differential equation in the Cartesian Co-ordinate. **(10)**

b) A vertical plate 2.2m high and 1.4m wide has been designed on free convention heating of liquid. The temperature of plate surface is maintained at 960 °C while the temperature of liquid is 340 °C.Calculate the heat dissipation from both side of plate. **(10)**

For convection coefficient, Use correlation $Nu = 0.13(Gr.Pr)^{0.33}$.

Properties of liquid at 650°C are $\rho = 10^4 kg/m^3$; $C_p = 150.7\, kJ/kg.K$; $k = 13.02\, W/mK$; $\mu = 3.12 kg/mh$

Q.3 a) Starting from basic derive an expression for effectiveness of parallel flow heat exchanger in terms of NTU and Capacity ratio. **(10)**

b) A longitudinal copper fin (k=380 W/m°C) 600 mm long and 5 mm diameter is exposed to air stream at 20°C. The convective heat transfer coefficient h is 20 W/m²°C. If the fin base temperature is 150°C, determine (i) the heat transferred in kJ/h and (ii) the efficiency of the fin. Assume that fin is insulated at the tip. **(10)**

4 a) An exterior wall of a house may be approximated by 10 cm layer of common brick (k = 0.75 W/m-deg) followed by 4 cm layer of gypsum plaster (k = 0.5 W/m-deg). What thickness of loosely packed rock wool insulation (k = 0.065 W/m-deg) should be added to reduce the heat loss or gain through the wall by 75%? **(10)**

b) A ceramic block is of 0.3 m × 0.2 m section and is 0.3 m in height. Surface temperature of the block is 380 °C.if it is exposed to air at 20 °C, **(10)**

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Determine the rate of convective heat loss.

Properties of air $\nu = 34.57 \times 10^{-6}$ m^2/s, $k = 37.81 \times 10^{-3}$ W/mK, **Pr.** =0.699.

The following empirical relation can be used

$$Nu_L = 0.55(Gr \times Pr)^{0.25}$$

5 a) Define Shape factor and discuss its properties. Derive an expression for shape factor for (i) Hemispherical shape of radius R (ii) Two concentric cylinders.

b) In a shell and tube heat exchanger, tubes are 4 m long, 3.1 cm OD, 2.7 cm ID. Water is heated from 22 °C to 45 °C by considering steam at 100 °C on the outside of tubes. Water flow rate through the tubes is 10 kg/s. Heat transfer coefficient on steam side is 5500 W/m^{2}K and water side, 850 W/m^{2}K. Neglecting all other resistances, find the number of tubes.

6 a) For transit conduction, with negligible internal resistance, with usual notations, show that: $\frac{\theta}{\theta_i} = \exp\left(-B_i \cdot F_o\right)$ Also state the significations of "B_i" and "F_o".

b) Write short note on any two of the following

i) Heisler Charts.

ii) Boiling curves and various regimes of boiling.

iii) Heat Pipe.

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