B.Tech. (ME) 6th Semester (G-Scheme) Examination, May–2024

MANUFACTURING TECHNOLOGY-II

Paper– PCC-ME-302-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note: *Attempt **five** questions in all, selecting **one** question from each Section. **Question No. 1 is compulsory.** All questions carry equal marks.*

1. Explain the following :

(a) Define tool life. 2.5

(b) Differentiate between G code and M code. 2.5

(c) What is Production flow analysis? 2.5

(d) Explain the choice of electrolytes in ECM process. 2.5

(e) Define Group Technology. 2.5

(f) What are the types of clamping devices? 2.5

Section-A

2. Explain Merchant cutting force circle with neat sketch. Explain the purpose and types of cutting fluids. 15

3. Explain essential characteristics of tool materials. The following data relate to an orthogonal turning process: Chip thickness = 0.62 mm, Feed =0.2 mm/rev., Rake angle = 15°. Estimate cutting ratio, shear angle and shear strain. 15

Section-B

4. Explain working Principle of Ultrasonic machining process with neat sketch. And discuss the influence of following parameters on USM process:
   (i) Amplitude and frequency of vibration
   (ii) Abrasive grain size
   (iii) Effect of slurry 15

5. Define jigs and fixture. Enumerate the advantages of jigs and fixture. 15

Section-C

6. Write short note on:
   (a) Machine control unit
   (b) Tool changer
   (c) DNC machine 15

7. What is the difference between incremental and absolute part programming method? Explain it with an example. 15

Section-D

8. What does classification and coding mean in group technology? Explain types of coding Systems. 15

9. Explain Group technology layout with neat sketch. Differentiate between group technology layout and functional layout of traditional plant. 15

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B.Tech. (ME) 6th Semester (G-Scheme) Examination, May–2024

DESIGN OF MACHINE ELEMENT-I

Paper– PCC-ME-304-G

ime allowed : 3 hours] *[Maximum marks : 75*

ote: *(i) Attempt any **five** questions in all, selecting **one** question from each unit. **Question No. 1 is compulsory.** All Questions carry equal marks.*

(ii) Use of following Design Data book is permitted:

(i) Design Data Handbook (In SI and Metric Units) for Mechanical Engineers by Mahadevan.

(ii) Design Data Book PSG College of Technology Coimbatore.

Answer any six out of seven questions

(a) Discuss the material of the rivets used in boiler. 2.5

(b) State and explain fits and tolerances. 2.5

(c) Define brain storming. 2.5

(d) What do you mean by stiffness design? 2.5

(e) In which cases the use of threaded joints is not recommended? 2.5

(f) Explain factor of safety. 2.5

(g) What is the function of an automotive clu

Unit-I

2. (a) What are the steps involved in design of machi elements? 7

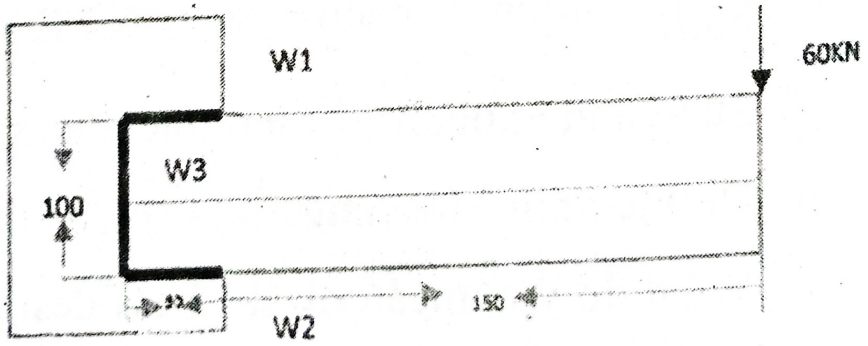
(b) Explain the term deviation and tolerances. 7

3. (a) Define and discuss optimum design. 7

(b) What do you mean by the term indentati hardness fatique, machinability and dampi capacity? 7

Unit-II

4. A welded connection, as shown in fig is subjected an eccentric force of 60kN in the plane of the weld Determine the size of the welds, if the permissib shear stress for the weld is 100 N/mm^2. Assume sta conditions.



5. It is required to design a cotter joint to connect tw steel rods of equal diameter. Each rod is subjected an axial tensile force of 50kN. Design the joint an specify its main dimensions.

Unit-III

6. A Marine type flange coupling is required to transmit 2900 KW power at a speed of 100 Rev/min. Flanges are connected by 8 taper bolts having an allowable shear stress of 60 N/mm^2. The material of shaft and bolts used is same. Design the flange coupling and determine the shaft diameter. 15

7. Determine the size of a wire rope necessary for a mine hoist carrying a load of 69.50 KN to be lifted from a depth of 225 meters. A rope speed of 7.9m/s is to be attained in 10 Sec. 15

Unit-IV

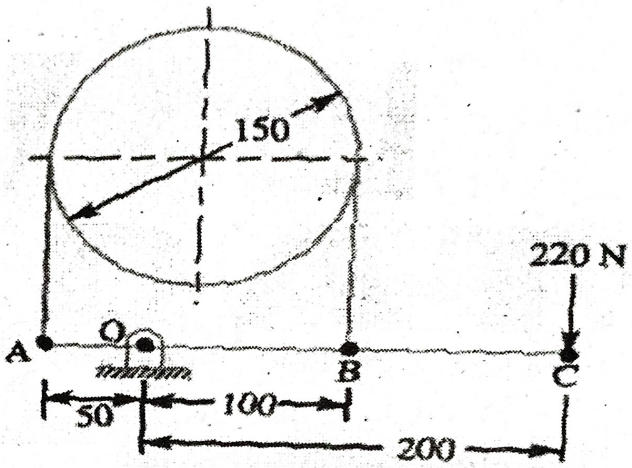
8. (a) What is a clutch? Discuss the various types of clutches giving at least one practical application for each. 5

   (b) A multiple disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 0.127 N/mm^2, find the power transmitted at 500 r.p.m. The outer and inner radii of friction surfaces are 125 mm and 75 mm respectively. Assume uniform wear and take coefficient of friction = 0.3. 10

9. A differential band brake has a force of 220 N applied at the end of a lever as shown in Fig. The coefficient of friction between the band and the drum is 0.4. The angle of lap is 180°. Find:

(i) The maximum and minimum force in the band when a clockwise torque of *450 N-m* is applied to the drum; and

(ii) The maximum torque that the brake may sustain for counter clockwise rotation of the drum. 15



All dimensions in mm.

B.Tech. (ME) 6th Semester (G-Scheme) Examination, May–2024
HEAT TRANSFER
Paper– PCC-ME-306-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note: *Attempt **five** questions in all, selecting **one** question from each unit. **Question No. 1 is compulsory.** All questions carry equal marks.*

1. (i) Define Thermal conductivity. What is the effect of temperature on it?

   (ii) What is meant by critical thickness of insulation? How it is calculated in case of sphere?

   (iii) Define Kirchhoff's law of radiation.

   (iv) Why thin fins are preferred over thick fins?

   (v) Draw temperature profile of a counter-flow heat exchanger.

   (vi) What is fouling factor of a heat exchanger? Write value for overall heat transfer coefficient considering fouling. 6×2.5=15

Unit-I

2. Explain cartesian coordinates of heat conduction. 15

3. Derive a conduction equation in cartesian for a spherical coordinate system. 15

Unit-II

4. Explain transient heat conduction in plane wall. 15

5. Derive an expression for heat dissipation from an infinite long fin. 15

Unit-III

6. Discuss the relation for hydrodynamic boundary layer. 15

7. Explain Stefan - Boltzmann law and explain shape factor and their relationship. 15

Unit-IV

8. Discuss the analysis of a parallel flow heat exchanger. 15

9. Write short note on: 8+7=15

   (i) Laminar film condensation on vertical plate.

   (ii) Bubble growth and Nucleate boiling

B.Tech. (ME) 6th Semester (G-Scheme) Examination, May–2024

DYNAMICS OF MACHINES

Paper– PCC-ME-308-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note: *Attempt **five** questions. **Question no. 1 is compulsory**. Attempt any **one** question from each section.*

1. Explain the following: 6×2.5=15

(a) Free-body diagrams of a mechanism

(b) Dynamic balancing

(c) Types of governor

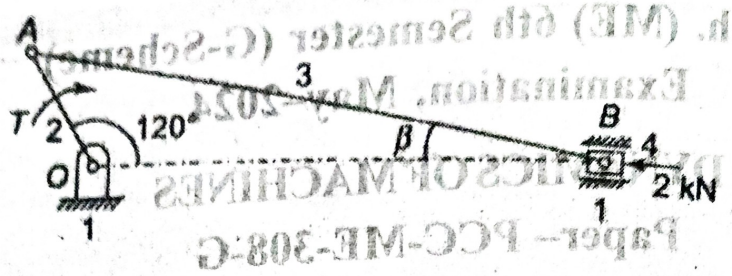
(d) Hammer blow

(e) Types of dynamometers

(f) Gyroscope and its primary function

Section–A

2. A slider-crank mechanism with the following dimensions is acted upon by a force F=2 kN at B as shown in Fig. OA= 100 mm, AB= 450 mm. Determine the input torque T on the link OA for the static equilibrium of the mechanism for the given configuration: 15



3. What are free body diagrams of a mechanism? How are they helpful in finding the various forces acting on the various members of the mechanism?

Section–B

4. Three masses of 8 kg, 12 kg and 15 kg attached at radial distances of 80 mm, 100 mm and 60 mm respectively to a disc on a shaft are in complete balance. Determine the angular position of the masses of 12kg and 15kg relative to the 8 kg mass.

5. Explain the 'Direct and Reverse Crank method' for determining unbalanced forces in radial engines.

Section–C

6. A Hartnell governor having a central sleeve spring and two right-angled bell crank levers moves between 290 r.p.m. and 310 r.p.m. for a sleeve lift of 15 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis and mass of each ball is 2.5 kg. The ball arms are parallel to the governor axis at the lower equilibrium speed. Determine: (i) loads on the spring for the lowest and the highest equilibrium speeds, and (ii) Stiffness of the spring.

7. (a) Describe with sketch of torsion dynamometer and explain with detail the calculations involved in finding the power transmitted. 8

(b) Describe the construction and operation of a prony brake dynamometer. 7

Section–D

8. Discuss the effect of the gyroscopic couple on the navalship in the following three cases:

(a) Steering

(b) Pitching

(c) Rolling 15

9. Derive expression for stability of a two wheel vehicle taking a turn in curved path. 15

B.Tech. (ME) (Elective-I) 6th Semester (G-Scheme) Examination, May–2024

INTERNAL COMBUSTION ENGINES & GAS TURBINE

Paper– PCC-ME-320-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note: *Attempt **five** questions in all selecting **one** from each unit. **Question no. 1 is compulsory.** All questions carry equal marks.*

1. (i) Explain Ericsson cycle. 6×2.5=15

(ii) Discuss two stroke and four stroke engine.

(iii) Draw and explain Sankey diagram.

(iv) Discuss SAE rating of lubricant.

(v) Multi-staging in gas turbine.

(vi) Exhuast Gas heat exchanger.

Unit-I

2. For an engine working on the ideal dual cycle, the compression ratio is 10 bar and the maximum pressure is limited to 70 bar. If the heat supplied is 1680 kJ/kg, find the pressure and temperatures at the various salient points of the cycle and the cycle efficiency. The pressure and temperature of air at the commencement of compression are 1 bar and 100°C respectively. Assume C_p=1.004 kJ/kg K and C_v = 0.717 kJ/ kg K for air. 15

3. With a neat sketch explain the working principle of carburator and derive an expression for air fuel ratio a simple carburator.

Unit -II

4. Explain the phenomena of Knock in CI engine and compare it with Si engine knock .

5. Describe the various types of cooling system and compare them. Why fins and baffles are required in air cooled engine? Explain.

Unit -III

6. The following observations were made during a trial o a single-cylinder four-stroke cycle gas engine having cylinder diameter of 18 cm and a stroke 24 cm. Duratio of trial 30 min, Total number of revolutions = 9000 Total number of explosions =4450
Mean effective pressure = 5 bar, Net load on brake whee = 40kg, Effective diameter of brake wheel = 1m,
Total gas used at NTP = 2.4m³, Calorific value of gas a NTP = 19 MJ/m³, Total air used = 36m³: Pressure of a = 720 mm of Hg, Temperature of air = 17°C,
Density of air at NTP = 1.29 kg/m³, Temperature o exhaust gases = 350°C, Room Temperature = 17°C,
Specific heat of exhaust gases=1 KJ/kg°C, cooling wate circulated = 80kg, Rise in temperature of cooling wate = 30°C. Draw a heat balance sheet and estimat mechanical and indicated thermal efficiencies of th engine (R = 287J/kg k).

7. Describe with sketches the following methods petrol exhaust emission control: 15

(i) Afterburner

(ii) Exhaust manifold reactor

(iii) Catalytic converter system

Unit-IV

8. Explain briefly Brayton cycle. Derive expression for optimum pressure ratio. Also describe with neat sketches the working of a simple constant pressure open cycle gas turbine. 15

9. Describe axial flow compressor. Draw velocity triangle and work done of a stage of axial flow compressor. Also discuss degree of reaction. 15