CBCS SCHEME

USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   **15ME61**

Sixth Semester B.E. Degree Examination, June/July 2019
Finite Element Analysis

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Explain the steps involved in FEM.   **(08 Marks)**
    b.   Discuss the convergence and compctability requirements of elements.   **(08 Marks)**

OR

2   a.   Explain the importance of Node numbering scheme.   **(06 Marks)**
    b.   What are simple, complex and multiplex elements?   **(10 Marks)**

Module-2

3   a.   Derive the shape function for quadratic 1D bar element.   **(06 Marks)**
    b.   Find the nodal displacement stress and reaction for the bar subjected to load as shown in Fig.Q3(b). Take $E_1 = 70$ GPa and $E_2 = 200$ GPa.   **(10 Marks)**

Fig.Q3(b)

OR

4   a.   Explain isoparametric, sub-parametric and superparametric elements.   **(06 Marks)**
    b.   For the two-bar truss shown in Fig.Q4(b), determine the displacements, stress in each elements and reactions at the support.   **(10 Marks)**
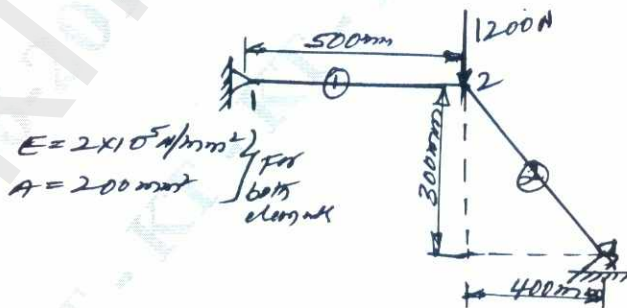

Fig.Q4(b)

Module-3

5   a.   Derive the Hermite function for beam element.   **(08 Marks)**
    b.   A cantilever beam subjected to a point load of 250 kN as shown in Fig.Q5(b). Determine the deflection at the free end and the support reactions. Take E = 200 GPa, $I = 4\times10^6$ mm^4.   **(08 Marks)**
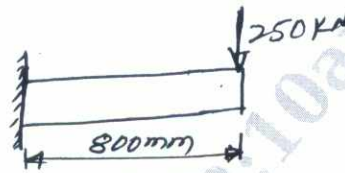
Fig.Q5(b)

OR

6 a. Explain the finite element formation of shaft. **(06 Marks)**
   b. A bar of circular cross section having a diameter of 50 mm is firmly fixed at its ends and subjected to a torque as shown in Fig.Q6(b). Determine maximum angle of twist and shear stress. Take $G = 7 \times 10^4$ N/mm^2 and $E = 2 \times 10^5$ N/mm^2. **(10 Marks)**
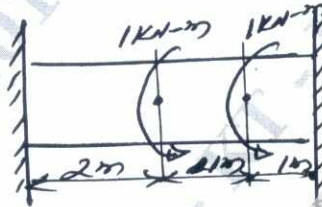

Fig.Q6(b)

Module-4

7 a. Explain the differential equation for an 1D-heat conduction. **(04 Marks)**
   b. A composite slab consists of three materials with thermal conductivities of 20 W/m °C, 30 W/m °C, 50 W/m °C and thickness 0.3m, 0.15m and 0.15m respectively as shown in Fig.Q7(b). The outer surface is at 20°C and the inner surface is exposed to the convective heat transfer coefficient of 25 W/m^2 °C and a medium at 800°C. Determine the temperature distribution within the wall. **(12 Marks)**
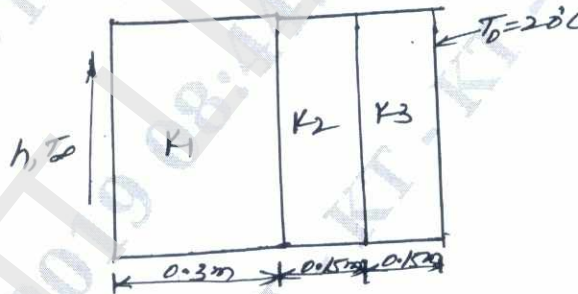

Fig.Q7(b)

OR

8 a. Derive the stiffness matrix for 1-D element with two-nodes having nodal fluid heads. **(06 Marks)**
   b. For the smooth pipe with uniform cross-section of 1m^2 as shown in Fig.Q8(b). Determine the flow velocities at the center and right end, by knowing the velocity at the left is $V_x = 2$m/sec. **(10 Marks)**
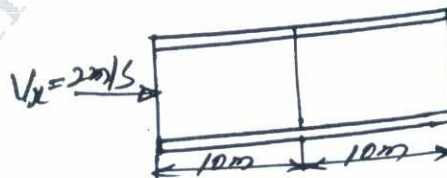
Fig.Q8(b)

Module-5

9 a. Derive the stiffness matrix of axisymmetric bodies with triangular element. **(12 Marks)**

   b. For the element of an axisymmetric body rotating with a constant angular velocity w = 1000 rev/min as shown in Fig.Q9(b). Determine the body force vector. Include the weight of the material, $\rho = 7850$ kg/m^3. **(04 Marks)**

Fig.Q9(b)

OR

10 a. Differentiate between lumped mass matrix and consistent mass matrix. **(06 Marks)**

   b. Device consistent mass matrix for truss element. **(10 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2019
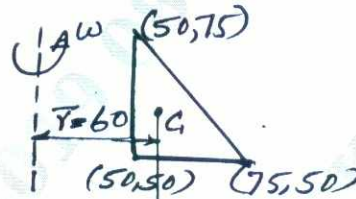## Computer Integrated Manufacturing

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Define automation. Explain different types of automation.   **(08 Marks)**
    b.   Explain the product life cycle mathematical models.   **(08 Marks)**

OR

2   a.   What is buffer storage? What are the reasons for implementing buffer storage in an automated production line?   **(04 Marks)**
    b.   Explain Upper bound approach in analysis of flow line without storage buffer.   **(03 Marks)**
    c.   A 20 station transfer line has two stages of 10 stations each. The ideal cycle time of each stage is 1.2 min. all the stations in the line have the same probabilities of stopping, p = 0.005. Assume that the downtime 8 min is constant when a breakdown occurs. Using upper bound approach, compute the line efficiency for the buffer stage capacities of (i) b = 0   (ii) b = ∞ (iii) b = 10   (iv) b = 100.   **(09 Marks)**

Module-2

3   a.   Explain the design process using computer aided design with a neat block diagram.   **(09 Marks)**
    b.   Explain scaling in geometric models transformations.   **(07 Marks)**

OR

4   a.   Explain generative type process planning system and list the advantages of CAPP. **(08 Marks)**
    b.   Write a note on Material Requirement Planning and shop floor control.   **(08 Marks)**

Module-3

5   a.   Explain Flexible Manufacturing Cell with a sketch.   **(06 Marks)**
    b.   State and explain the components of Flexible Manufacturing System.   **(10 Marks)**

OR

6   a.   Briefly explain the following: i) Minimum rational work element   ii) Precedence diagram iii) Cycle time   **(06 Marks)**
    b.   In a plant a product is to be assembled as per the following information: **(10 Marks)**

Elements	Time (Te) min	Immediate Predecessor
1	5	-
2	3	1
3	8	1
4	2	2
5	1	2
6	6	3
7	4	4, 5
8	5	3, 5
9	3	7, 8
10	6	6, 9

    i)   Construct the precedence diagram.
    ii) If the cycle time is 10 min. what is the number of stations required?
    iii) Compute the balance delay of the line by using Largest Candidate Rule method.

Module-4

7   a.   What do you mean by cutter radius compensation in CNC programming? Briefly explain. (02 Marks)

    b.   Write different M-codes used in programming and their functions. (04 Marks)

    c.   Write a turning centre part program for the part shown in Fig.Q7(c). Use one finish cut and rest rough cut to remove the material. Use the following information.

Operation	Tool No.	Onset Register	Cutting speed (m/min)	Feed (mm/rev)
Rough cut	T01	10	200	0.4
Finishing	T02	12	300	0.2

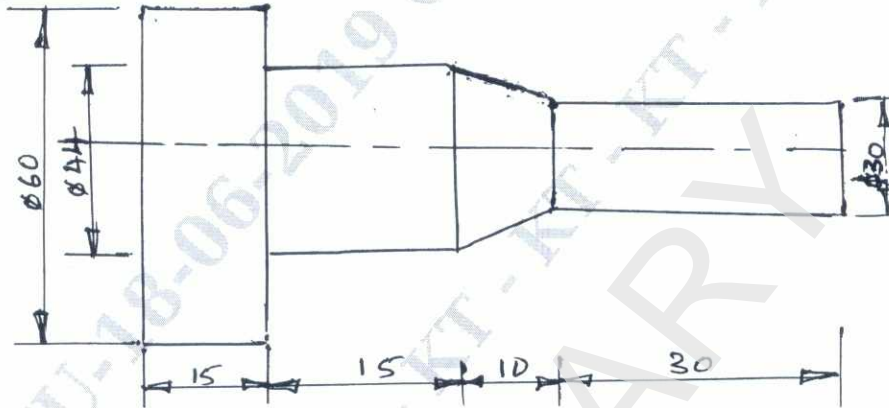Fig.Q7(c)   (10 Marks)

OR

8   a.   Sketch and explain common robot configurations. (10 Marks)

    b.   Mention the different types of grippers. (02 Marks)

    c.   Explain lead through method of robot programming. (04 Marks)

Module-5

9   a.   What is additive manufacturing? Explain the basic principles involved in additive manufacturing. (10 Marks)

    b.   List the advantages of additive manufacturing. (06 Marks)

OR

10 a.   Write a note on Internet of Things. (08 Marks)

    b.   How these AM processes are carried out:
        i)   Binder Jetting
        ii) Direct energy Deposition
        iii) Material Jetting
        iv) Hybrid Manufacturing (08 Marks)

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Sixth Semester B.E. Degree Examination, June/July 2019
Heat Transfer

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of heat transfer data hand book and steam tables are permitted.

Module-1

1   a. State the laws governing three basic modes of heat transfer. **(06 Marks)**
    b. Derive the general three-dimensional conduction equation in Cartesian coordinates and state the assumptions made. **(10 Marks)**

OR

2   a. Derive an expression for the temperature distribution through the plane wall with uniform thermal conductivity. **(06 Marks)**
    b. A metal [K = 45 W/m°C] steam pipe of 5 cm inside diameter and 6.5 cm outside diameter is lagged with 2.75 cm thickness of high temperature high insulation having thermal conductivity 1.1 W/m°C. convective heat transfer coefficients on the inside and outside surfaces are 4650 W/m^{2}K and 11.5 W/m^{2}K respectively. If the steam temperature is 200°c and the ambient temperature is 25°C. Calculate:
    i) Heat loss per metre length of pipe
    ii) Temperature at the interfaces
    iii) Overall heat transfer coefficient to inside and outside surfaces. **(10 Marks)**

Module-2

3   a. Derive an expression for critical thickness of insulation for a cylinder. **(06 Marks)**
    b. The handle of a ladle used for pouring molten metal at 327°C is 30 cm long and is made of 2.5 cm × 1.5 cm mild steel bar stock [K = 43 W/mK]. In order to reduce grip temperature, it is proposed to make a hallow handle of mild steel plate 0.15 cm thick to the same rectangular shape. If the surface heat transfer coefficient is 14.5 W/m^{2}K and the ambient temperature is 27°C, estimate the reduction in the temperature of grip. Neglect the heat transfer from inner surface of the hallow shape. **(10 Marks)**

OR

4   a. What is lumped system analysis? Derive the temperature variation using lumped parameter analysis. **(06 Marks)**
    b. An iron sphere of diameter 5 cm is initially at a uniform temperature of 225°C. It is suddenly exposed to an ambient at 25°C with convection coefficient of 500 W/m^{2}K.
    i) Calculate the centre temperature 2 minute after the start of exposure.
    ii) Calculate the temperature at a depth of 1 cm from the surface after 2 minute of exposure.
    iii) Calculate the energy removed from the sphere during this period.
    Take thermo physical properties of iron sphere K = 60 W/mK, ρ = 7850 kg/m^3, C = 460 J/kg, α = 1.6 × 10^{-5} m^2/s. **(10 Marks)**

Module-3

5 a. Explain the three types of boundary conditions are applied in finite difference representations. **(06 Marks)**
   b. Derive the relation between normal intensity and emissive power. **(10 Marks)**

OR

6 a. Explain:
      i) Stefan Boltzman law
      ii) Kirchoff's law
      iii) Planks law **(06 Marks)**
   b. Two large parallel plates with $\in = 0.5$ each, are maintained at different temperatures and are exchanging heat only by radiation. Two equally large radiations shields with surface emissivity 0.05 are introduced in parallel to the plates. Find the percentage reduction in net radiative heat transfer. **(10 Marks)**

Module-4

7 a. Explain the physical significance of:
      (i) Prandtl number   (ii) Reynolds number   (iii) Nusselt number **(06 Marks)**
   b. Air at 1 atm pressure and temperature 25°C flowing with a velocity 50 m/s crosses an industrial heater made of long solid rod of diameter 20 mm. The surface temperature of the heater is 457°C. Determine the allowable electrical power density (W/m^3) within the heater per meter length. **(10 Marks)**

OR

8 a. A circular plate of 25 cm diameter with both surfaces maintained at a uniform temperature of 100°C is suspended horizontally in atmospheric air at 20°C. Determine the heat transfer from the plate. **(10 Marks)**
   b. Obtain the fundamental relationship between Nusselt, Prandtle and Reynolds number using Buckingham's π - theorem for forced convection heat transfer. **(06 Marks)**

Module-5

9 a. Derive an expression for LMTD for a parallel flow heat exchanger. **(06 Marks)**
   b. A refrigerator is designed to cool 250 kg/hr of hot fluid of specific heat 3350 J/kg°C at 120°C using a parallel arrangement 1000 kg/hr of cooling water is available for cooling purposes at a temperature of 10°C. If the overall heat transfer coefficient is 1160 $W/m^2°C$ and the surface area of the heat exchanger is 0.25 m^2. Calculate the outlet temperature of the cooled liquid and water and also the effectiveness of the heat exchanger and rate of heat transfer. **(10 Marks)**

OR

10 a. Sketch and explain boiling curve. **(06 Marks)**
   b. The outer surface of a vertical tube 80 mm in outer diameter and 1m long is exposed to saturated steam at atmospheric pressure. The tube surface is maintained at 50°C by flow of water through the tube. What is the rate of heat transfer to coolant and what is the rate of condensation of steam? **(10 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2019
Design of Machine Elements – II

Time: 3 hrs.   Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of design data handbook is permitted.
3. Assume suitably missing data.

Module-1

1   a. Differentiate between straight and curved beam.   **(04 Marks)**
    b. A closed ring is made up of 50mm diameter steel bar having allowable tensile stress of
        200 MPa. The inner diameter of ring is 100mm. For the load of 30 kN, find the maximum
        stress in the bar and specify the location. If the ring is cut as shown part B of the Fig.Q1(b),
        check whether it is safe to support the applied load.   **(12 Marks)**

Fig.Q1(b)

OR

2   a. A high pressure cylinder consists of a steel tube with inner and outer diameter of 20 mm and
        40mm respectively. It is jacketed by an outer steel tube with an outer diameter of 60mm.
        The tubes are assembled by shrinking process in such a way that maximum principal stress
        is limited to 100 MPa. Calculate the shrinkage pressure and original dimensions of the tube.
        Take E = 207 kN/mm².   **(08 Marks)**
    b. A cylinder of 200 mm diameter is covered with a cast iron plate and is fixed at
        circumference. Its thickness is 9mm and is subjected to a uniform force of 6 kN over a
        diameter of 100 mm. Find the stress induced in the plate and deflection under load.
        Take E = 120 kN/mm².   **(08 Marks)**

Module-2

3   a. Sketch and explain Block and Tackle mechanism of wire rope.   **(06 Marks)**
    b. It is required to design a V-belt drive to connect a 7.5 kW, 1440 rpm induction motor to a
        fan, running at approximately 480 rpm, for a service of 24 hours per day. Space is available
        for a centre distance of about 1m.   **(10 Marks)**

OR

4   a. For a Leaf spring prove that stress in full length leaves is 50% greater than that of graduated
        leaves.   **(06 Marks)**

b. At the bottom of a mine shaft a group of 10 identical close coiled helical springs are set in parallel to absorb the shock caused by the falling of the cage in case of a failure. The loaded cage weighs 75 kN, while the counter weight has a weight of 15 kN. If the loaded cage falls through a height of 5m from rest, find the maximum stress induced in each spring if it is made of 50mm diameter steel rod. The spring index is 6 and the number of active turns in each spring is 20. Modulus of rigidity $G = 8 \times 10^4$ N/mm^2. **(10 Marks)**

Module-3

5 Design a pair of helical gears to transmit 15 KW at 1200 rpm of pinion. The gear is to rotate at 600 rpm. The helix angle is 17.5°. The centre distance between the gears is 150mm. The pinion is made of high carbon steel ($\sigma_0 = 103.5$ MPa) and gear of 0.40% carbon steel, untreated ($\sigma_0 = 69.6$ MPa). **(16 Marks)**

OR

6 a. Derive an expression for Beam strength of a spur gear tooth : (Lewis equation). **(06 Marks)**
   b. The following parameters refers to a pair of right angle bevel gears:
   Power to be transmitted = 8 kW
   Speed of pinion = 1600 rpm
   Pcd of pinion = 100 mm
   Speed of gear = 400 rpm
   Permissible static stress for both gear materials = 138 MPa
   Calculate module face width of gears number of teeth on pinion and gear. **(10 Marks)**

Module-4

7 In a worm gear speed reducer, the speed reduction is 30:1. Design the worm gear drive from consideration of strength to connect two shafts which are 275mm apart and transmits 7.5 kW at a worm speed of 3000 rpm. The worm is made of hardened steel ($\sigma_0 = 200$ MPa) and worm wheel of phosphor bronze ($\sigma_0 = 84$ MPa). The teeth are 20° stub. **(16 Marks)**

OR

8 a. A multi disc clutch has three discs on the driving shaft and two on the driven shaft. The inside diameter of the contact surface is 120mm. The maximum pressure between the surface is limited to 0.1 N/mm^2, calculate outside diameter of contact surface for transmitting 25 kW at 1575 rpm. Assume uniform wear condition at coefficient of friction of 0.3. **(08 Marks)**
   b. A differential band brake operates on a sheave of 420 mm diameter and rotates at 5 rev/sec. The brake has to absorb 21 kW. Coefficient of friction is 0.25. Determine the force 'F' required to set the brake for clockwise rotation, refer Fig.Q8(b). **(08 Marks)**
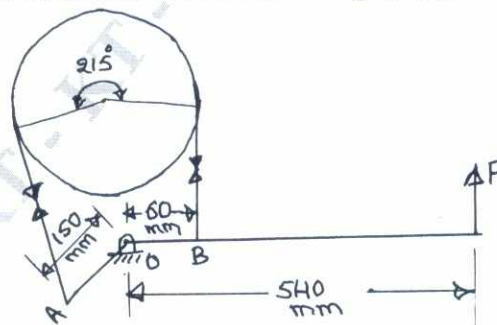

Fig.Q8(b)

Module-5

9 a. A 75 mm long full journal bearing of diameter 75mm supports a load of 10 kN. The speed of the journal is 1200 rpm. The absolute viscosity of the oil is 10×10^{-3} Pas and the diametral clearance ratio is 0.001. Determine the coefficient of friction by using
(i) Petroff's equation   (ii) McKee's equation   (iii) Raimondi and Boyd curve.   **(08 Marks)**

b. A full journal bearing of 50mm diameter, 75 mm long supports a radial load of 1000 N. The speed of the shaft is 600 rpm. The surface temperature of bearing is limited to 60°C and the room temperature is 30°C. Determine the viscosity of the oil, if the bearing is well ventilated and no artificial cooling is to be used. The ratio of journal diameter to diametral clearance is 1000.   **(08 Marks)**

OR

10 a. A ball bearing operates in the following work cycle.

Element	Radial load N	Speed rpm	Element time %
1	3000	720	30
2	7000	1440	40
3	5000	900	30

The dynamic load capacity of bearing is 16500 N. Calculate
(i)   Average speed of rotation
(ii) Equivalent radial load
(iii) Bearing life.   **(08 Marks)**

b. A single row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The values of X and Y are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75mm and bearing number 6315 is selected for this application.
(i) Estimate the life of this bearing with 90% reliability.
(ii) Estimate the reliability for 20,000 hours life.   **(08 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2019
Metal Forming

Time: 3 hrs.   Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. With neat sketch, explain the classification of metal working processes on the basis of force applied. **(08 Marks)**
   b. Explain Tresca and Von – Mises yield criterion. **(08 Marks)**

OR

2 a. Show triaxial stress system, with a neat sketch and also represent the same in a matrix form. **(08 Marks)**
   b. An aluminum alloy having σ_0 [uniaxial flow stress] as 500 MPa is subjected to three principle stresses σ_x = 200 MPa (tensile) σ_y = 100 MPa (tensile) σ_z = 150 MPa (compressive) and shear stress = 50 MPa (τ_{xy}). Will the material exhibit yielding. If not, what is the safety factor? **(08 Marks)**

Module-2

3 Explain the effect on the following on metal working processes :
   a. Temperature.
   b. Friction and lubrication.
   c. Hydrostatic pressure.
   d. Deformation zone geometry. **(16 Marks)**

OR

4 a. With neat sketch, explain the working :
   i) Board drop hammer   ii) Steam hammer. **(08 Marks)**
   b. What is the forging load required to convert 1m long 1m diameter cylindrical bloom into a square section of the same area of cross section? Given the tensile yield strength of the material as 104 MPa and co-efficient of friction 0.5. Assume plain strain condition for forging. **(08 Marks)**

Module-3

5 a. Explain with neat sketch, following rolling mills :
   i) Cluster mill   ii) Tandem mill   iii) Three high mill. **(08 Marks)**
   b. A 300mm wide aluminum alloy steel is hot rolled in thickness from 20 to 15mm. The rolls are 1m in diameter operates at 100 rpm. The uniaxial flow stress for the aluminum alloy is given $140 \in^{0.2}$ MPa. Determine the rolling load and the power required for this hot reduction. Use QP a factor which depends on percentage of reduction and ratio of the roll radius thickness as 1.5. **(08 Marks)**

OR

6 a. With neat sketch, explain tube drawing without mandrel. **(08 Marks)**
   b. Explain Optimal Die angle and dead zone formation in drawing. **(08 Marks)**

Module-4

7 a. Give the classification of extrusion process and explain hydrostatic extrusion process, with neat sketch. (08 Marks)
   b. Explain the following :
      i) Defects in extrusion   ii) V – bending process. (08 Marks)

OR

8 a. Explain with neat sketch, the following :
      i) Rubber forming   ii) Lubrication in extrusion. (08 Marks)
   b. Explain with neat sketch, Forming limit criterion. (08 Marks)

Module-5

9 a. Explain with neat sketch, Explosive forming using stand – off technique. (08 Marks)
   b. List the advantages and disadvantages of Powder metallurgy , Applications. (08 Marks)

OR

10 a. With a flow chart, explain in detail the powder metallurgy process. (08 Marks)
   b. List the advantages and disadvantages of "HERF" (High Energy Rate Forming), applications. (08 Marks)

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15ME655

Sixth Semester B.E. Degree Examination, June/July 2019
Automobile Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With the help of PV diagram, compare SI and CI engines. **(06 Marks)**
   b. With help of neat sketch give construction details of connecting rod. **(05 Marks)**
   c. With help of neat sketch, explain pre-chamber type of combustion chamber. **(05 Marks)**

OR

2 a. Why cooling is necessary and what are different methods of cooling? **(04 Marks)**
   b. Classify valve operating mechanisms and with the help of diagram, explain overhead inlet and side exhaust valve mechanism. **(06 Marks)**
   c. Explain dry sump lubrication system, with help of neat sketch. **(06 Marks)**

Module-2

3 a. With the help of neat sketch explain multi-plate clutch. **(08 Marks)**
   b. Sketch and explain Hotch Kiss Drive and also compare with torque tube. **(08 Marks)**

OR

4 a. Explain working of master cylinder of a braking system with the help of neat sketch. **(10 Marks)**
   b. What is ABS? Explain with appropriate sketch. **(06 Marks)**

Module-3

5 a. Define following: (i) Camber   (ii) Caster   (iii) King pin inclination **(06 Marks)**
   b. With the help of sketch explain Mac person strut type sub pension. **(10 Marks)**

OR

6 a. What are the requirements of Ignition system? **(04 Marks)**
   b. Sketch and explain Electronic Ignition system. **(08 Marks)**
   c. Compare Battery and Magneto Ignition system. **(04 Marks)**

Module-4

7 a. What do you mean by supercharging? Explain any one method of super charging. **(06 Marks)**
   b. Explain centrifugal type of super charger. **(06 Marks)**
   c. What are limitations of turbo charging? **(04 Marks)**

OR

8 a. What are fuel mixture requirements for SI engine? **(04 Marks)**
   b. Explain working of Zenith carburetor. **(08 Marks)**
   c. What are CRDI engine? Explain principle of working. **(04 Marks)**

Module-5

9   a.   Mention various pollutants. List measures to be taken to reduce pollution. **(04 Marks)**
    b.   Discuss positive crank case ventilation system to control crank case emission. **(06 Marks)**
    c.   Discuss how evaporative emissions can be controlled. **(06 Marks)**

OR

10 a.   Discuss about, how air injection system controls pollution. **(06 Marks)**
    b.   Write short notes on any two:
        i)   Catalytic converter
        ii) Euro IV norms for petrol and diesel engines
        iii) Redesign of combustion chamber to control emission. **(10 Marks)**

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CBCS SCHEME

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Sixth Semester B.E. Degree Examination, June/July 2019
Industrial Safety

Time: 3 hrs.   Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define Industrial safety in context with OHS. What are the issues and topics it covers pertaining to Industry. **(08 Marks)**
   b. How do you categorize workplace hazards? Explain briefly with suitable examples. **(08 Marks)**

OR

2 a. In construction, explain the hazards related to scaffolding and fall. What are the measures to be taken for protection? **(08 Marks)**
   b. What is Material Safety Data Sheet (MSDS)? Explain the different sections of MSDS. **(08 Marks)**

Module-2

3 a. What are the different classes of fire? Explain with examples. **(08 Marks)**
   b. What is Fire Tetrahedron? Discuss various types of fire extinguishers and their applications. **(08 Marks)**

OR

4 a. List and explain common fire hazards and how they can be prevented. **(08 Marks)**
   b. In case of fire accidents, what are the intervention methods and techniques to be adopted to control fire? **(08 Marks)**

Module-3

5 a. What precautions are needed to avoid accident in material handling? **(08 Marks)**
   b. What is Risk Assessment, Analysis and Evolution? How do you implent in case of welding operations? **(08 Marks)**

OR

6 a. Explain the various mechanical hazards associated with machines. **(08 Marks)**
   b. Discuss the various safety control measures, with respect to machines. **(08 Marks)**

Module-4

7 a. Define Electrical Safety. List the basic factors to be considered to ensure electrical safety in industries. **(08 Marks)**
   b. What kind of injuries result from electrical current? Discuss briefly the preventive measures related to electrical hazards. **(08 Marks)**

OR

8 a. What safety precautions to be taken by electrical safety engineer and discuss the role and responsibility. **(08 Marks)**
   b. List and explain various Personal protection equipment used in handling electrical equipments. **(08 Marks)**

Module-5

9 a. What is Chemical Safety? List and explain various chemical hazards. **(08 Marks)**
   b. Discuss what are guidelines to be followed when working with chemicals. **(08 Marks)**

OR

10 a. Explain the methods in implement for labeling of chemicals. **(08 Marks)**
   b. With a suitable case study, explain implementation of chemical safety in a CNG plant. **(08 Marks)**

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CBCS SCHEME

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Sixth Semester B.E. Degree Examination, June/July 2019
Total Quality Management

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. List out six basic concepts of TQM and briefly explain them.   **(09 Marks)**
   b. With a diagram, explain TQM FrameWork.   **(05 Marks)**
   c. List out the benefits of implementing TQM.   **(02 Marks)**

OR

2 a. Briefly describe the various benefits of ISO Registration.   **(07 Marks)**
   b. Explain the various requirements for ISO 9001 series.   **(09 Marks)**

Module-2

3 a. Explain briefly the seven characteristics of effective people.   **(07 Marks)**
   b. List out Deming's 14 points of TQM philosophy and explain any three.   **(09 Marks)**

OR

4 a. What is Quality Council? List out its duties.   **(06 Marks)**
   b. Explain seven steps for strategic planning.   **(10 Marks)**

Module-3

5 a. Define the term internal customer and external customer. Give an example for each type.
                                                                                         (03 Marks)
   b. Explain Kano's model of customer satisfaction.   **(08 Marks)**
   c. Describe briefly the customer retention.   **(05 Marks)**

OR

6 a. Define 'empowerment' and what are the three conditions to achieve empowerment?
                                                                                         (04 Marks)
   b. Explain Maslow's theory of motivation and relate this to any industry or organization.
                                                                                         (10 Marks)
   c. List out various advantages of employee involvement.   **(02 Marks)**

Module-4

7 a. Explain PDSA cycle for continuous improvement.   **(08 Marks)**
   b. Explain: (i) Juran Trilogy   (ii) Kaizen principles   **(08 Marks)**

OR

8 a. Explain Pareto diagram, Scatter diagram and Cause-Effect diagram.   **(09 Marks)**
   b. What are control charts? Explain their importance, construction for TQM organization.
                                                                                         (07 Marks)

Module-5

9 a. What is 'Bench-Marking'? Explain briefly the process of Benchmarking.   **(08 Marks)**
   b. Describe briefly the Environmental Management System Model.   **(08 Marks)**

OR

10 a. What is QFD? Describe the various steps involved in QFD.   **(08 Marks)**
   b. Explain Failure Mode and Effect Analysis, Product liability.   **(08 Marks)**

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