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VTU QUESTION PAPERS INDEX LIST JULY- AUGUAT 2021

DEPARTMENT OF AUTOMOBILE ENGINEERING			
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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐   **18AU32**

Third Semester B.E. Degree Examination, July/August 2021
Engineering Thermodynamics

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions.
2. Use of thermodynamic data handbook and steam table is permitted.

1 a. Define a thermodynamics system, cycle, process, property and thermal equilibrium.
      (10 Marks)
   b. Using zeroth law of thermodynamics, explain the temperature concept.   **(10 Marks)**

2 a. Define work and heat. Mention the sign convention for both. Also give the comparison between them.   **(10 Marks)**
   b. Explain the following with sketch
      (i) electrical work
      (ii) paddle wheel work   **(10 Marks)**

3 a. Derive an expression for work done in a steady flow process.   **(08 Marks)**
   b. State Clausius and Kelvin Plank statements of second law of thermodynamics and prove that they are equivalent.   **(12 Marks)**

4 a. Explain the following applications of SFEE
      (i)   steam turbine
      (ii) nozzle   **(08 Marks)**
   b. Distinguish between reversible and irreversible process. Also explain the factors that make process irreversible.   **(12 Marks)**

5 a. Explain the principle of increase of entropy.   **(10 Marks)**
   b. With the help of TS diagram, derive an expression for work done for available and unavailable energy.   **(10 Marks)**

6 a. With the help of a neat sketch, explain how dryness fraction of a wet steam is measured by using combined separating and throttling calorimeter.   **(10 Marks)**
   b. Define a pure substance with example. Also draw a P-T diagram for pure substance and indicate all necessary points on it and also mention its importance.   **(10 Marks)**

7 a. With neat sketches (including T-S and p-h diagrams), explain vapour compression refrigeration system.   **(10 Marks)**
   b. What is a refrigerant? Explain the desirable properties of refrigerants.   **(10 Marks)**

8 a. The conditions of atmospheric air is 40°C DBT and 40% RH. The air is cooled to 25°C DBT. If the air supply to the system is 200 m^3/min, find :
      (i)   Heat removed from air per minute
      (ii) RH of air
      Take air pressure to be 1.01325 bar.   **(10 Marks)**
   b. With the help of schematic diagram and appropriate psychrometric chart, explain winter air conditioning system.   **(10 Marks)**

9 a. Derive an expression for work done in a two stage compressor. **(10 Marks)**

b. Explain multi-stage compression with PV diagram. Also mention the advantages of multistage compressor over single stage compressor. **(10 Marks)**

10 a. A gas turbine set takes in air at 15°C and 1 bar, pressure ratio is 5. The maximum temperature is 600°C and it develops 220 KW. The turbine and compressor efficiencies are 0.85, determine:

    (i) Actual overall efficiency

    (ii) The weight of air circulated/min

    (iii) Useful power developed per kg of air **(10 Marks)**

b. Explain the following with suitable sketch:

    (i) Pulse jet

    (ii) Rocket propulsion **(10 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐   18AU33

Third Semester B.E. Degree Examination, July/August 2021
Material Science and Metallurgy

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a. With a neat sketches, explain Body Centered Cubic and Face Centered Cubic.   **(10 Marks)**
    b. Discuss the different types of Point Imperfections.   **(10 Marks)**

2   a. Define the following terms:
        i)   Ductility
        ii) Toughness
        iii) Yield strength
        iv) True stress.   **(10 Marks)**
    b. Differentiate between slip and twinning with neat sketches.   **(10 Marks)**

3   a. Explain types of fractures with figures.   **(10 Marks)**
    b. What are the different types of fatigue loading? Explain with sketches.   **(10 Marks)**

4   a. Define following terms:
        i)   Fatigue life
        ii) Fatigue strength
        iii) Endurance limit
        iv) Creep.   **(10 Marks)**
    b. Explain the tree stages of creep with a neat sketch. Describe the properties of creep.
                                                                                    (10 Marks)

5   a. Define solid solutions and explain different types of solid solution with figure.   **(10 Marks)**
    b. Compare Homogeneous and Heterogeneous nucleation with sketches.   **(10 Marks)**

6   a. Write a note on cooling curves.   **(10 Marks)**
    b. Explain following terms with respect to phase diagrams:
        i)   Eutectic
        ii) Eutectoid
        iii) Peritectic
        iv) Peritectoid   **(10 Marks)**

7   a. Explain the construction of T.T.T diagram with figure and label it.   **(10 Marks)**
    b. Explain following terms:
        i)   Annealing
        ii) Normalizing
        iii) Hardening
        iv) Tempering   **(10 Marks)**

8   a. Write short notes on flame hardening and induction hardening.   (10 Marks)
    b. Explain the composition, properties and application of
       i)   Grey Cast Iron
       ii) Malleable Cast Iron.   (10 Marks)

9   a. Write short notes on the following:
       i)   Al-Si alloys
       ii) Brasses.   (10 Marks)
    b. Explain the composition, properties and application of
       i)   Aluminum-copper alloys
       ii) Aluminum-zinc alloys.   (10 Marks)

10 a. Define the composite material. Explain the different types of matrix material and types of
       reinforcements.   (10 Marks)
    b. Explain advantages, disadvantages and applications of composite material.   (10 Marks)

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# Third Semester B.E. Degree Examination, July/August 2021
Mechanics of Materials

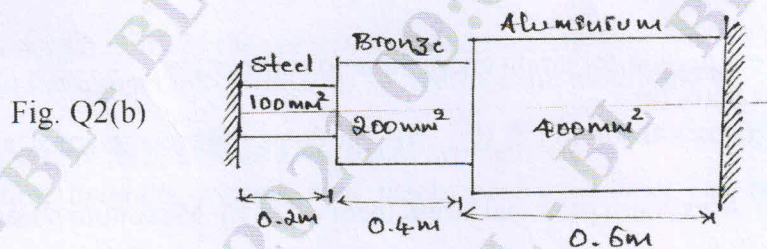Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. List and explain the mechanical properties of Engineering Materials.   **(10 Marks)**
   b. The stepped bar shown in Fig. Q1(b) is subjected to a pull of 25kN. The bar is made up of two different materials having Young's modulus.
       $E_1 = 200$ GPa and $E_2 = 100$ GPa. Find the extension of the bar and stress in each materials.   **(10 Marks)**

Fig. Q1(b)
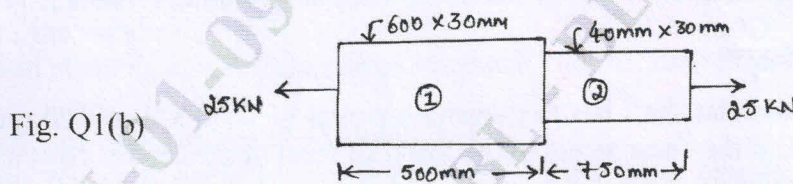
2 a. Show the relation between Young's Modulus, Modulus of Rigidity and Bulk Modulus.
                                                                                        (10 Marks)
   b. A compound bar consisting of Steel, Bronze and Aluminum bars connected in series is held between two supports as shown in Fig. Q2(b). When the temperature of the compound bar is increased by 50^0C, determine the stresses induced in each bar. Consider the two cases :
       i) Rigid supports and   ii) Supports yield by 0.5mm. Take $\alpha_s = 12 \times 10^{-6}/^0$C ,
       $\alpha_B = 19 \times 10^{-6}/^0$C , $\alpha_{A1} = 22 \times 10^{-6}/^0$C, $E_S = 200$ GPa , $E_B = 83$ GPa and $E_{A1} = 70$ GPa
                                                                                        (10 Marks)

Fig. Q2(b)

3 a. Show that the sum of the normal stresses on any two planes at right angles in a general two dimensional stress system is constant.   **(10 Marks)**
   b. A point in a beam is subjected to maximum tensile stress 110 MPa and shear stress 30 MPa. Find the magnitude and directions of principal stresses. If the point in the beam is in the compression zone under the same magnitude of bending stress and shear stress. Find the magnitudes of principal stresses and their directions.   **(10 Marks)**

4 a. Derive Lame's equations for radial and hoop stress in case of thick cylinders.   **(10 Marks)**
   b. A cylindrical pressure of 1 meter inner diameter and 1.5 meters long is subjected to an internal pressure P_1 thickness of the cylinder wall is 15mm. Taking allowable stress for cylinder materials as 90 MPa. Determine i) Magnitude of maximum internal pressure 'P' that the pressure vessel can withstand and   ii) Change in dimensions.
       Take E = 200 GPa and r = 0.3.   **(10 Marks)**

5 a. Define and explain the following terms : i) Shear force   ii) Bending Moment
      iii) Concentrated load   iv) Uniformly distributed load   v) Uniformly varying load.
                                                                      (10 Marks)
   b. A simply supported beam of length 6m, carries point load of 3kN and 6kN at distances of
      2m and 4m from the left end. Draw the shear force and bending moment diagrams for the
      beam.   **(10 Marks)**

6 a. What do you mean by 'Simple Bending'? What are the assumptions made in the theory of
      simple bending?   **(08 Marks)**
   b. An I – section beam 350mm × 150mm has a web thickness of 10mm and a flange thickness
      of 20mm. If the shear force acting on the section is 40kN, find the maximum shear stress
      developed in the I - section.   **(12 Marks)**

7 a. Derive the relation for a circular shaft when subjected to torsion as given by
      $$\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{L}.$$ **(10 Marks)**
   b. A solid circular shaft has to transmit a power of 1000 KW at 120 rpm. Find the diameter of
      the shaft, if the shear stress of the material must not exceed $80 N/mm^2$. The maximum torque
      1.25 time of its mean. What percentage of saving in material would be obtained if the shaft
      is replaced by hollow one whose internal diameter is 0.6 times its external diameter, the
      length , material and maximum shear stress being same?   **(10 Marks)**

8 a. Derive an expression for the Euler's Crippling load for a long Column when both the ends of
      the column are hinged.   **(10 Marks)**
   b. Find the Euler's crippling load for a hollow cylindrical steel column of 40mm external
      diameter and 4mm thick. The length of the column is 2.5m and is hinged at both ends. Also
      compute the Rankine's Crippling load using constants 335 MPa and Y_{7500}.
      Take E = 205 GPa.   **(10 Marks)**

9 a. Derive an expression for strain energy due to shear stress.   **(10 Marks)**
   b. Write short notes on :
      i) Castigliano's theorem I & II   ii) Modulus of resilience of strain energy. **(10 Marks)**

10 a. Explain i) Maximum principal stress theory   ii) Maximum shear stress theory.
                                                                        (10 Marks)
    b. Determine the strain energy and hence the deflection at the free end of a cantilever beams of
       length 'L' carrying a point load 'W' at its free end.   **(10 Marks)**

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Third Semester B.E. Degree Examination, July/August 2021
Mechanical Measurement and Metrology

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a. With block diagram, explain the different stages of the generalized measurement system with suitable example.   **(14 Marks)**
    b. Define Measurement. State its significance.   **(06 Marks)**

2   a. State the objectives of Metrology.   **(08 Marks)**
    b. Define Line standard.   **(02 Marks)**
    c. With neat sketch, explain the material standard "International Prototype Meter".   **(10 Marks)**

3   a. Mention the basic features of a Comparator.   **(03 Marks)**
    b. With a neat sketch, explain the construction and working of Zeiss – Ultra Optimeter.   **(11 Marks)**
    c. State the limitations of a Mechanical Comparator.   **(06 Marks)**

4   a. With neat diagram, explain the Working of a Sine - Centre.   **(10 Marks)**
    b. Explain the working principle of a Sine bar.   **(10 Marks)**

5   a. State the advantages of Electrical transducers.   **(04 Marks)**
    b. With an example, explain primary and secondary transducers.   **(08 Marks)**
    c. Explain the various types of elastic members used in pressure sensing.   **(08 Marks)**

6   a. With a sketch, explain the construction and important parts of a CRO.   **(10 Marks)**
    b. Explain the temperature problems of intermediate modifying devices.   **(10 Marks)**

7   a. With a neat sketch, explain an unequal arm balance.   **(10 Marks)**
    b. With neat diagram, explain how mechanical dynameter can be used to measure torque.   **(10 Marks)**

8   a. State the steps followed for proper preparation and mounting of strain guages.   **(06 Marks)**
    b. Briefly explain the problems associated with strain guage installations.   **(06 Marks)**
    c. With sketch, explain wire type and foil type resistance strain guages.   **(08 Marks)**

9   a. Explain the meaning of "Interchangeability" and "Selective Assembly".   **(10 Marks)**
    b. With sketches, explain "Hole – basis" and "Shaft – basis" system of fit. Explain why hole basis system is preferred over shaft basis systems.   **(10 Marks)**

10 a. With sketch, explain the working of a low pressure measuring instrument.   **(10 Marks)**
    b. With sketch, explain how an optical pyrometer is used for measuring temperature. **(10 Marks)**

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18AU36

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Third Semester B.E. Degree Examination, July/August 2021
Manufacturing Process - I

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Explain the steps involved in making a casting. **(08 Marks)**
   b. Explain different materials used for making patterns. **(06 Marks)**
   c. Write a note on advantages and limitation of casting process. **(06 Marks)**

2 a. Explain various pattern allowances (any 3) provided in casing technology with sketch. **(08 Marks)**
   b. Explain properties of moulding sand required to produce a sound casting. **(08 Marks)**
   c. Explain any '2' types of cores used in casting process. **(04 Marks)**

3 a. Explain sand slinger machine used in moulding of operation with neat sketch. **(06 Marks)**
   b. Explain Goose neck type hot chamber die casting process with neat sketch. **(08 Marks)**
   c. Explain semi centrifugal casting with neat sketch. **(06 Marks)**

4 a. Explain investment moulding with neat diagrams. **(10 Marks)**
   b. Explain the working of Cupola furnace with neat sketch. **(10 Marks)**

5 a. Explain welding defects and its causes with neat sketch. **(08 Marks)**
   b. Explain types of flames produced in gas welding with neat sketch. **(08 Marks)**
   c. Write a note on functions of flux. **(04 Marks)**

6 a. Explain the formation of different zones in welding with neat sketch. **(06 Marks)**
   b. Explain oxy-acetylene gas welding process with neat sketch. **(08 Marks)**
   c. Explain the differences between leftward and rightward welding techniques, with neat sketch. **(06 Marks)**

7 a. Explain spot welding types of resistance welding with neat sketch. **(06 Marks)**
   b. Explain explosive welding with neat sketch. **(06 Marks)**
   c. Explain TIG welding with neat sketch. **(08 Marks)**

8 a. Explain Laser welding with neat sketch and mention its advantages and limitations. **(10 Marks)**
   b. Explain electron beam welding with neat sketch and mention its advantages and limitations. **(10 Marks)**

9 a. Explain different types of soldering with neat sketch (any 3). **(10 Marks)**
   b. Explain Radiography method of inspection with neat sketch. **(10 Marks)**

10 a. Explain liquid penetrant inspection method with neat sketch. **(10 Marks)**
    b. Explain ultrasonic inspection method of NDT with neat sketch. **(10 Marks)**

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CBCS SCHEME

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17AU81

Eighth Semester B.E. Degree Examination, July/August 2021
Vehicle Body Engineering and Safety

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a.   Draw the layout of bus and coach bodies and explain.   **(10 Marks)**
    b.   Discuss the classification of commercial vehicle bodies with a neat sketch and mention their features.   **(10 Marks)**

2   a.   Write the classification of cars and explain.   **(10 Marks)**
    b.   Explain the terms used in body building construction with the help of sketch.   **(10 Marks)**

3   a.   What are the different types of plastics used in vehicle body construction? Explain the specification and properties.   **(10 Marks)**
    b.   With a neat block diagram, explain the process of painting.   **(10 Marks)**

4   a.   What are different types of glasses used in body construction? Explain the specification and properties.   **(10 Marks)**
    b.   Write a short notes on : i) Paints   ii) Aluminum.   **(10 Marks)**

5   a.   With a neat sketch, discuss various forces and moments acting on a vehicle in motion.   **(10 Marks)**
    b.   Explain the wind tunnel test with a neat sketch to determine the drag coefficient of a vehicle.   **(10 Marks)**

6   a.   Explain with a suitable sketches, stress analysis of a closed integral vehicle structure.   **(10 Marks)**
    b.   Discuss the symmetrical and asymmetrical loading for vehicle body design with suitable sketches.   **(10 Marks)**

7   a.   Sketch and explain the concept of visibility of a driver for both front and rear in a vehicle.   **(10 Marks)**
    b.   With a neat sketch of a driver seat with relative dimensions for two classes of vehicles.   **(10 Marks)**

8   a.   Sketch and explain the driver's seat position in relation to the steering wheel and pedal in case of passenger car.   **(10 Marks)**
    b.   Explain briefly the window winding concept and seat adjustment mechanisms.   **(10 Marks)**

9   a.   Explain the various sources of noise and methods to control the noise.   **(10 Marks)**
    b.   Explain the following :
       i)   Body structural vibration
       ii)   Chassis bearing vibration.   **(10 Marks)**

10   a.   Explain the various safety devices used in a vehicle.   **(10 Marks)**
     b.   What is a bumper? Explain the different types of bumper.   **(10 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐   **17AU82**

Eighth Semester B.E. Degree Examination, July/August 2021
Mechanical Vibration

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions.

1   a.   Differentiate between:
        (i)   Linear and non-linear vibration
        (ii) Deterministic and random vibration
        (iii) Longitudinal, transverse and torsional vibration   **(10 Marks)**

    b.   Split the harmonic motion $x = 10\sin\left(\omega t + \dfrac{\pi}{6}\right)$ into two harmonic motions one having phase

         angle of zero and the other of 45°. Use both analytical and graphical method.   **(10 Marks)**

2   a.   Determine the natural frequency of the spring mass system as shown in Fig.Q2(a). Take
         mass of the spring into account, use energy method.

Fig.Q2(a)   **(10 Marks)**
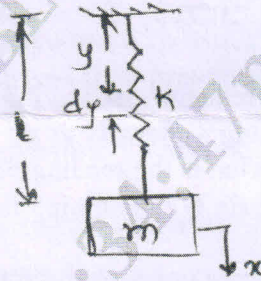
    b.   A block of mass 0.05 kg is suspended from a spring having a stiffness of 25 N/m. The block
         is displaced downward from its equilibrium position through a distance of 2 cm and released
         with an upward velocity of 3 m/sec. Determine:
        (i)   Natural frequency   (ii) Period of oscillation
        (iii) Maximum amplitude of vibration   (iv) Maximum velocity
        (v)   Maximum acceleration   (vi) Phase angle   **(10 Marks)**

3   a.   Setup the differential equation for spring mass-damper system and obtain complete solution
         for the critical damped condition.   **(08 Marks)**

    b.   A spring-mass-dashpot system is given an initial displacement zero and velocity of XW_n
         where W_n is the undamped natural frequency of the system. Find the equation of motion for
         the system, when (i) $\xi = 0.5$ (ii) $\xi = 1$ (iii) $\xi = 2.5$ **(12 Marks)**

4   a.   Obtain an expression for whirling of shaft with air damping.   **(08 Marks)**

    b.   A shaft 1.5 cm dia and 1m long is held in long bearings. The weight of the disc at the centre
         of the shaft is 15 kg. The eccentricity of the centre of gravity of the disc from centre of rotor
         is 0.03 cm. The modulus of elasticity of the material of the shaft is 2×10^6 kg/cm². The
         permissible stress in the shaft material is 700 kg/cm². Find :
        (i)   The critical speed of the shaft
        (ii) The range of speed over which it is unsafe to run the shaft. Neglect the weight of the
              shaft.   **(12 Marks)**

1 of 2

5 a. Show that providing damping in vibration isolation is not useful, when the frequency ratio is more than 1.414 or $\sqrt{2}$. **(10 Marks)**

   b. A machine of total mass 17 kg is mouted on springs having stiffness is 11000 N/cm. A piston within the machine has a mass of 2 kg has a reciprocating motion with stroke 7.5 cm and speed 6000 rpm. Assuming the motion to the SHM. Take $\xi = 0.2$. Determine:
   (i) Amplitude of motion   (ii) Transmissibility   (iii) Force transmitted to the foundation **(10 Marks)**

6 a. Find the solution for the differential equation of a spring-mass system under forced vibration without damping. **(08 Marks)**

   b. An engine weighing 1000 N including reciprocating parts is mounted on springs. The weights of the reciprocating parts is 22 N. and the stroke is 90 mm. the engine speed is 720 rpm:
   (i)   Neglecting damping, find the stiffness of the springs, so that the force transmitted to the foundation is 5% of the amplitude force.
   (ii) If under the actual working condition the damping reduces the amplitude of successive vibration by 25%, determine the force transmitted at 720 rpm. **(12 Marks)**

7 a. Explain the principle of dynamic vibration absorber. **(10 Marks)**

   b. Use Lagranges equation to find the natural frequency and amplitude ratio of the system as shown in Fig.Q7(b).
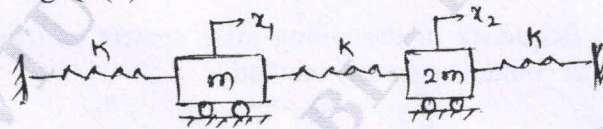

Fig.Q7(b)   **(10 Marks)**

8 a. Explain two types of frequency measuring instruments, with neat sketches. **(10 Marks)**

   b. The motion of vibrating system is to be recorded by a seismic instrument having natural frequency 1500 Hz. What is the reading of the instrument, if the motion is given by equation $Z = 1.5\sin 188.5t + 0.5\sin 377t$ damping factor is 0.65. **(10 Marks)**

9 Find all the natural frequencies of the four degree of freedom system shown in Fig.Q9 by Holzer's method.
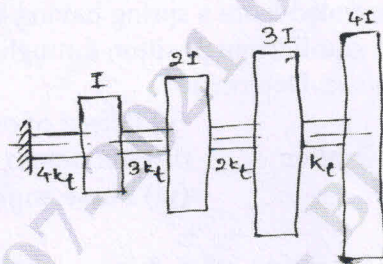

Fig.Q9   **(20 Marks)**

10 Explain Stodola's method and determine fundamental mode of vibration and its natural frequency of spring-mass system shown in Fig.Q10 by Stodola's method.
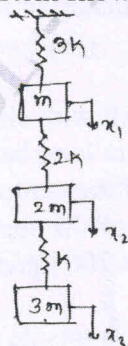

Fig.Q10   **(20 Marks)**

** 2 of 2 **

15AU81

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Eighth Semester B.E. Degree Examination, July/August 2021
Vehicle Body Engineering and Safety

Time: 3 hrs.   Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Draw the layouts of bus and coach bodies and explain. **(08 Marks)**
   b. Explain the following terms used in body building construction:
      (i)   Wheel arch   (ii) Seat rail
      (iii) Cant rail.   (iv) Angle of approach. **(08 Marks)**

2 a. What are the different methods of construction of vehicle body? Explain. **(08 Marks)**
   b. Discuss the classification of Car bodies with neat sketches and mention their features. **(08 Marks)**

3 a. Discuss the salient features of following materials used for body work of an automobile:
      (i) Aluminium alloy   (ii) Alloy steel   (iii) Timber   (iv) Plywood **(08 Marks)**
   b. What are the different types of glasses and rubbers used in vehicle body construction? Explain. **(08 Marks)**

4 a. What are the salient features of glass reinforced plastics? Discuss. **(08 Marks)**
   b. Briefly explain the types of corrosion and their prevention methods. **(08 Marks)**

5 a. Explain with a suitable sketch, aerodynamic forces and moments acting on vehicle body and their effects. **(08 Marks)**
   b. Explain the various methods of reducing aerodynamic drag in a vehicle. **(08 Marks)**

6 a. With a neat sketch, explain the construction and working of wind tunnel used to determine drag co-efficient of a vehicle. **(08 Marks)**
   b. Describe the longitudinal loads and side loads acting on a vehicle body with suitable sketches. **(08 Marks)**

7 a. Explain the complete design considerations for drive seat of a car, with a neat sketch. **(08 Marks)**
   b. With a neat sketch, explain the construction and working of window winding mechanism. **(08 Marks)**

8 a. Sketch and explain the concept of visibility of a driver for both front and rear. **(08 Marks)**
   b. Briefly explain longitudinal and lateral stability. **(08 Marks)**

9 a. What are various sources of noise in a vehicle? Explain. **(08 Marks)**
   b. Discuss the various methods used for controlling noise and vibration in a vehicle. **(08 Marks)**

10 a. What are the necessary features of safe vehicle body? **(06 Marks)**
   b. Discuss the safety aspects of a bumper design and also explain the different types of bumper. **(10 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐   **15AU82**

Eighth Semester B.E. Degree Examination, July/August 2021
Mechanical Vibrations

Time: 3 hrs.   Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Explain longitudinal, transverse and torsional vibrations.   **(06 Marks)**

   b. Add the following harmonics analytically and validate graphically $x_1 = 4\cos(\omega t + 10°)$, $x_2 = 6\sin(\omega t + 60°)$.   **(10 Marks)**

2 a. Find equivalent stiffness of springs connected in series and parallel, with usual notations.   **(08 Marks)**

   b. Determine the natural frequency of mass m = 15 kg as shown in Fig. Q2 (b), assuming that chords do not stretch and slide over the pulley rim. Assume pulley has no mass and take $K_1 = 8 \times 10^3$ N/m and $K_2 = 6 \times 10^3$ N/m.   **(08 Marks)**

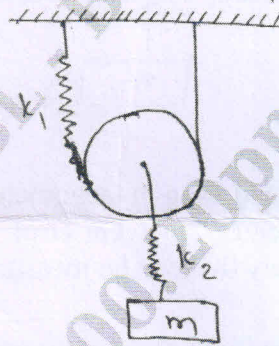Fig. Q2 (b)

3 a. Set up the differential equation for damped free vibration and obtain the complete solution for critically damped system.   **(10 Marks)**

   b. Vibratory system in a vehicle is to be designed with K = 100 N/m, C = 2 NS/m, M = 1 kg. Calculate the (i) Decrease of amplitude from its starting value after complete oscillations (ii) The frequency of oscillation.   **(06 Marks)**

4 a. Obtain the relationship for shaft running at critical speed with damping.   **(08 Marks)**

   b. The rotor of a turbo super charged weighing 9 kg is keyed to the center of 25 mm diameter steel shaft 40 cm between bearings. Determine
   (i) The critical speed of shaft.
   (ii) The amplitude of vibration of the rotor at a speed of 3200 rpm if the eccentricity is 0.015 mm. Assume shaft supported by simply supported. Take E = 210 GPa, $\rho = 8000$ kg/m³   **(08 Marks)**

5 a. Define transmissibility. Derive expression for motion transmissibility.   **(08 Marks)**

   b. A machine of total mass 17 kg is mounted on springs having stiffness 11000 N/cm. A piston within the machine has a mass of 2 kg has a reciprocating motion with stroke 7.5 cm and speed 6000 rpm. Assume the motion is SHM. Determine
   (i) Amplitude of machine (ii) Transmissibility. (iii) Force transmitted.   **(08 Marks)**

6 a. Derive an expression for motion of rotating unbalanced machine. **(08 Marks)**

b. The weight of an electric motor is 125 kg and it runs at 1500 rpm. The armature weighs 35 kg and its centre of gravity lies 0.05 cm from axis of rotation. The motor is mounted on 5 springs of negligible damping so that the force transmitted is one-eleventh of impressed force. Assuming the weight is equally distributed among the 5 springs.
Determine following :
- (i) Stiffness of each spring.
- (ii) Dynamic force transmitted to base.
- (iii) Natural frequency of the system. **(08 Marks)**

7 a. What is dynamic vibration absorber? **(02 Marks)**

b. The figure Fig. Q7 (b) below shows a vibrating system having 2 degrees of freedom. Determine the 2 natural frequencies of vibrations and the ratio of amplitudes of motion of m_1 and m_2. For the two modes of vibration. **(14 Marks)**
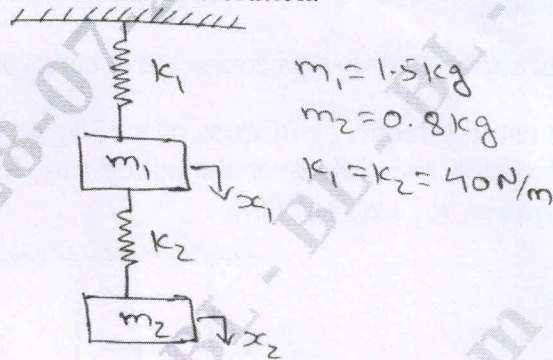

$m_1 = 1.5 kg$
$m_2 = 0.8 kg$
$K_1 = K_2 = 40 N/m$

Fig. Q7 (b)

8 a. Explain Fullerron and Fran m tachometer with neat sketches. **(12 Marks)**

b. A vibrometer indicates 2 percent error in measurement and its natural frequency is 5 Hz. If the lowest frequency that can be measured is 40 Hz. Find the value of damping factor (ξ). **(04 Marks)**

9 a. Explain Maxwell reciprocal theorem. **(06 Marks)**

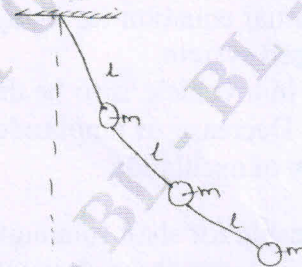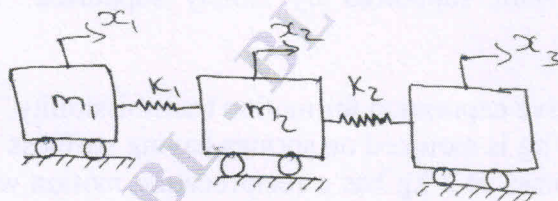b. Find the influence coefficients, for the system shown in Fig. Q9 (b). **(10 Marks)**

Fig. Q9 (b)

10 Determine natural frequency and mode shape of system shown in Fig Q10 by Holzer's method. **(16 Marks)**

$m_1 = 2$ kg ;
$m_2 = 4$ kg ;
$m_3 = 2$ kg ;
$K_1 = 5$ N/m ;
$K_2 = 10$ N/m

Fig. Q10

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17AU831

Eighth Semester B.E. Degree Examination, July/August 2021
Total Quality Management

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Define Total Quality Management and discuss briefly the various dimensions of quality.
                                                                             (10 Marks)
   b. With a neat block diagram, explain the TQM framework.   **(10 Marks)**

2 a. Describe the various steps involved in customer satisfaction process. **(10 Marks)**
   b. Discuss in detail 12 behaviour or characteristics of a successful quality leaders. **(10 Marks)**

3 a. Explain the following :
      i) PDCA cycle
      ii) Benefits of 5's.   **(10 Marks)**
   b. With an examples, explain the Failure Mode And Effect Analysis (FMEA) process.
                                                                             (10 Marks)

4 a. Elaborate with an necessary graph how six sigma will benefits the productivity of process.
                                                                             (10 Marks)
   b. Discuss in detail the benefits of Reengineering process in TQM.   **(10 Marks)**

5 a. How would you explain the methodology of constructing an affinity diagram by using an illustration. **(10 Marks)**
   b. Compare between the tree diagram and matrix diagram.   **(05 Marks)**
   c. Explain the usage of nominal group techniques.   **(05 Marks)**

6 a. With an example, explain how activity network diagram helps to solve problems. **(10 Marks)**
   b. Write a note on fundamental concept of why–why forced filled analysis with an examples.
                                                                             (10 Marks)

7 a. What do you understand by human resource management? Why is it needed? **(06 Marks)**
   b. List out the various advantages of employee involvement.   **(06 Marks)**
   c. Discuss in brief job rotation and mention its merits and demerits.   **(08 Marks)**

8 a. What are principles of job design? Discuss in brief various methods of job design. **(10 Marks)**
   b. Distinguish between training and development.   **(05 Marks)**
   c. Explain the advantages and drawbacks of performance appraisal.   **(05 Marks)**

9 a. What are control charts? Explain the procedure for preparing control charts for attributes.

(08 Marks)

b. A machine set to deliver packets of a given weight. 10 sample of size 5 each were recorded. Below a given relevant data. Calculate the central line and the control limit for mean chart and the range chart also draw the charts and then comment state of control given data $A_2 = 0.5$, $D_3 = 0$, $D_4 = 2.115$.

Sample number	1	2	3	4	5	6	7	8	9	10
Mean ($\overline{X}$)	15	17	15	18	17	14	18	15	17	16
Range (R)	7	7	4	9	8	7	12	4	11	5

(12 Marks)

10 a. James a manager of a 500 room. Hotel he wants to achieve highest level of service. For 7 days, you collect data on readiness of 200 rooms. Is this process in control? Draw the P charts. (P – charts).

Day	1	2	3	4	5	6	7
Rooms	200	200	200	200	200	200	200
Not ready	16	7	21	17	25	19	16
Proportion	0.080	0.035	0.105	0.085	0.125	0.095	0.080

(12 Marks)

b. Describe the difference between an attributes control chart and variable control chart.

(08 Marks)

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