CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ 17ME71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Energy Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the principle of over feed stokes with neat diagram. (10 Marks)
   b. Explain Hydraulic ash handling process, with a neat sketch. (10 Marks)

OR

2 a. A chimney is 28m height and temperature of hot gases inside is 320^0C. The temperature of outside air is 23^0C and furnace is supplied with 15kg of air per kg of coal burnt. Calculate
   i) Draught in mm of water   ii) Draught head in meters of hot gases. (10 Marks)
   b. Explain the central or bin system of burning pulverised coal. (10 Marks)

Module-2

3 a. With a neat diagram, explain the general layout of diesel power plant. (10 Marks)
   b. Explain the general layout of hydroelectric power plant, with a neat diagram. (10 Marks)

OR

4 a. Classify the hydroelectric power plants on the basis of head. Explain each type of plant in detail. (10 Marks)
   b. With a neat diagram, explain Pump Fuel injection system. (10 Marks)

Module-3

5 a. Explain Pyranometer with neat sketch to measure beam and diffused radiations. (10 Marks)
   b. With a neat diagram, explain typical solar flat plate collector. (10 Marks)

OR

6 a. What are the main advantages of solar ≟ cell? Explain the conversion of solar energy to electricity through photovoltaic cell. (10 Marks)
   b. Explain Phase change (Latent heat) heat storage concept. Explain the properties of materials used in latent heat storage. Comment on Latent heat storage materials. (10 Marks)

Module-4

7 a. Derive an expression for the power of wind mill with condition. (10 Marks)
   b. With neat diagram, explain Single basin storage Tidal Power Plant and also comment on the advantages of Tidal Power Plant (Tidal). (10 Marks)

OR

8 a. Explain the typical horizontal axis wind mill, with a neat sketch. (10 Marks)
   b. What are the different resources that can be used as Biomass for biogas generation? (10 Marks)

Module-5

9 a. Describe the photosynthesis process with relevant chemical reactions. Also explain the importance of photosynthesis in biofuel generation. (10 Marks)
   b. Explain closed Rankine cycle OTEC system with neat sketch. (10 Marks)

OR

10 a. Explain with a neat sketch, the water dominated Geothermal system. (10 Marks)
    b. What is the work of fuel cell? Explain typical H_2O_2 fuel cell with a neat sketch. (10 Marks)

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USN ☐☐☐☐☐☐☐☐☐☐   **17ME72**

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Fluid Power Systems

Time: 3 hrs.   Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1   a. What are the various applications of fluid power systems?   **(05 Marks)**
   b. State Pascal's law and mention the various advantages of fluid power systems.   **(05 Marks)**
   c. Explain the various components used in hydraulic systems and its symbol.   **(10 Marks)**

OR

2   a. Describe the various functions of hydraulic fluids and its types.   **(05 Marks)**
   b. Define the fluid properties such as viscosity, viscosity index, pour point, fire point, flash point.   **(05 Marks)**
   c. Explain the working of return line and suction line filtering with the aid of sketches.   **(10 Marks)**

Module-2

3   a. What are the various types of positive displacement pump used in fluid power system?   **(05 Marks)**
   b. Explain with a sketch the construction and working of bladder type accumulator used in fluid power system.   **(05 Marks)**
   c. Explain the construction and working of external gear pump with a neat sketch.   **(10 Marks)**

OR

4   a. Explain the construction and working of double acting cylinder with a neat sketch. **(05 Marks)**
   b. An 8 cm diameter hydraulic cylinder has a 4 cm diameter rod. If the cylinder receives flow at 100 LPM and 12 MPa. Find the
     (i)   Extension and retraction speeds.
     (ii)   Extension and retraction load carrying.   **(05 Marks)**
   c. Explain the construction and working of a hydraulic cylinder cushioning with a neat sketch. Also draw symbol.   **(10 Marks)**

Module-3

5   a. List various types of control valves.   **(03 Marks)**
   b. With a neat sketch explain the working of pressure relief valve.   **(07 Marks)**
   c. Explain the hydraulic regenerative circuit with a neat sketch.   **(10 Marks)**

OR

6   a. With a neat sketch, explain the working of ball type check valve.   **(05 Marks)**
   b. With a neat sketch, explain the working of the 4/2 manually operated direction control valve.   **(05 Marks)**
   c. Explain the hydraulic cylinder sequencing circuits with a neat sketch.   **(10 Marks)**

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Module-4

7 a. Describe the various components used in pneumatic power systems and its symbol.
   (05 Marks)

   b. Explain the working of a single acting type of pneumatic cylinder with a neat sketch.
   (05 Marks)

   c. Explain the construction and working of lubricator used in pneumatic system with a neat sketch.
   (10 Marks)

OR

8 a. Explain the working of a shuttle valve used in pneumatic system with a neat sketch.
   (05 Marks)

   b. What are the various ways the pneumatic cylinders are mounted? (05 Marks)

   c. Explain the working of solenoid operated valve with a neat sketch. (10 Marks)

Module-5

9 a. Explain the speed control pneumatic circuits with a suitable sketch. (10 Marks)

   b. Explain the OR function of controlling the single acting pneumatic cylinder with a neat circuit.
   (10 Marks)

OR

10 a. Explain the controlling of pneumatic cylinders in a sequence as $A^+ B^+ B^- A^-$ by cascading method.
    (10 Marks)

    b. Explain electro pneumatic control of double acting cylinder with a suitable circuit. (10 Marks)

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Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Control Engineering

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1　a. What is closed loop control system? （02 Marks）
　b. Explain the closed loop control system with an example. （08 Marks）
　c. Describe proportional + Integral + Derivative control system with its characteristics. （10 Marks）

OR

2　a. What are the requirements of an ideal control system? Explain any three in detail. （10 Marks）
　b. Explain :
　　i) Proportional control system
　　ii) Proportional and integral control system. （10 Marks）

Module-2

3　a. Find the transfer function of mechanical system shown in Fig.Q3(a).

Fig.Q3(a) （10 Marks）
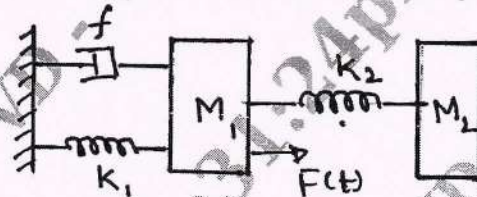
　b. Draw the signal flow graph for the following set of equations and obtain the transfer function:

$x_2 = a_{12} x_1 + a_{32} x_3 + a_{42} x_4 + a_{52} x_5$

$x_3 = a_{23} x_2$

$x_4 = a_{34} x_3 + a_{44} x_4$

$x_5 = a_{35} x_3 + a_{45} x_4$ （10 Marks）

OR

4　a. Derive the differential equation of first order electrical system. （05 Marks）
　b. A gas filled thermometer has a thermal resistance of R and is filled with a gas whose thermal capacitance is C. Obtain the transfer function relating the temperature of the gas inside the thermometer to the temperature of the medium in which the thermometer is inserted. Neglect capilarity of the thermometer. （05 Marks）
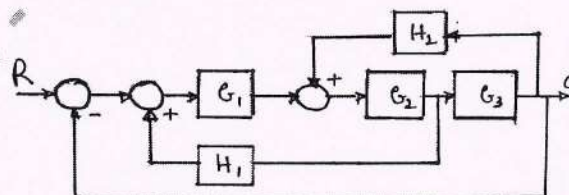　c. Determine the transfer function of the system shown in Fig.Q4(c), by block diagram reduction method.

Fig.Q4(c) （10 Marks）

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Module-3

5 a. A unity feedback control system has $G(s) = \dfrac{25}{s(s+5)}$. Determine the following quantities if it is subjected to unit step input

    i) Rise time
    ii) Peak time
    iii) Maximum over shoot
    iv) Settling time for 2% tolerance. **(08 Marks)**

   b. Define : i) Absolute stability   ii) Relative stability. **(04 Marks)**

   c. Investigate the stability of the control system using R–H criteria. The characteristic equation is $s^4 + 2s^3 + 11s^2 + 18s + 18 = 0$. **(08 Marks)**

OR

6 Sketch the root locus plot for a system whose open loop transfer function :

$$G(s)H(s) = \frac{K[s^2 + 6s + 25]}{s[s+1][s+2]}$$

Show that the system is absolutely stable. **(20 Marks)**

Module-4

7 Draw the BODE plots for the system having the open loop transfer function :

$$G(s)H(s) = \frac{K}{s[s^2 + 2s + 5]}.$$

Determine the value of K to obtain

i) A phase margin of 50° ii) A gain margin of 10db. **(20 Marks)**

OR

8 Determine the stability of the open loop control system

$$G(s)H(s) = \frac{10[s+1]}{s[s-1][s+5]}$$ using Nyquist method. **(20 Marks)**

Module-5

9 a. Explain phase lead compensation. **(08 Marks)**
   b. Define : i) State variables ii) State vector. **(04 Marks)**

   c. Evaluate the observability of the system with $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & 4 & 1 \end{bmatrix}$

   Using Gilbertz test. **(08 Marks)**

OR

10 a. Explain phase lag compensation. **(08 Marks)**
    b. What are the advantages of state variable analysis? **(04 Marks)**
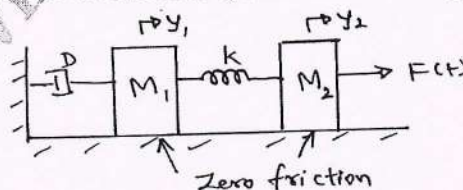   c. Obtain the state equation for the mechanical system shown in Fig.Q10(c).

Fig.Q10(c) **(08 Marks)**

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Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Tribology

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Briefly explain history of Tribology.   (06 Marks)
    b.   Discuss the effect of pressure and temperature on viscosity.   (08 Marks)
    c.   Write a note on selection of lubricants.   (06 Marks)

OR

2   a.   State and prove Hasen-Poiseuille Law.   (10 Marks)
    b.   With a neat sketch, explain saybolt viscometer.   (10 Marks)

Module-2

3   a.   Define the term friction. Explain the measurement of friction by tilted plane method.
                                                                                  (10 Marks)
    b.   Explain Bowden and Tabor's adhesion theory of friction.   (10 Marks)

OR

4   a.   Define wear; briefly explain different types of wear.   (10 Marks)
    b.   Explain the Delamination theory of wear.   (10 Marks)

Module-3

5   a.   Derive the Petroff's equations for a lightly loaded journal bearing. Also state the assumptions made.   (10 Marks)
    b.   A full journal bearing have the following specifications, shaft diameter 45mm, bearing length 65mm, radial clearance ratio is 0.0015, speed 2800rpm, radial load 800N, viscosity of the lubricant 8.27×10^{-3}PaS. The bearing is lightly loaded, determine :
         i)   Friction torque at the shaft
         ii)   Co-efficient of friction
         iii) Power loss.   (10 Marks)

OR

6   Derive the Reynold's equation in two dimension. Also state the assumption made. (20 Marks)

Module-4

7   a.   Derive an expression for the load carrying capacity of a plane slider bearing with fixed shoe.
                                                                                  (10 Marks)
    b.   Slider bearing with pivoted shoe has the following specifications, B = 0.0508mts, L = 0.0625mts, U = 5.58 mts/sec, W = 8006.4N, η = 0.03 N-s/m². Determine :
         i) Minimum film thickness   ii) Power loss angle of inclination corresponds to minimum co-efficient of frictions.   (10 Marks)

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OR

8   a. Derive the expression for load carrying capacity and rate of flow of oil through a hydro-static step bearing. **(10 Marks)**

   b. A hydrostate circular thrust bearing has the following data. Shaft diameter = 300mm, diameter of packet = 200mm, shaft speed = 100rpm, Pressure at the pocket = 500kN/m^2, film thickness = 0.07mm, viscosity of lubricant = 0.05Pas. Determine :
      i)   Load carrying capacity
      ii) Oil flow rate
      iii) Power Loss due to friction. **(10 Marks)**

Module-5

9   a. Briefly discuss any ten desirable properties of a good bearing materials. **(10 Marks)**

   b. Briefly discuss the common bearing materials that are used in practice. **(10 Marks)**

OR

10 a. Briefly explain the various mode by which surface properties can be enhanced. **(10 Marks)**

   b. Briefly explain different techniques to achieve surface modifications. **(10 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐ 17ME52

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Dynamics of Machinery

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   What is free body diagram? Explain with simple sketches.   **(05 Marks)**

    b.   In a 4 bar link mechanism shown in Fig Q1(b) the link 4 subjected to a torque T_4 = 20N-m. The link length are AD = 800mm, AB = 300mm, BC = 700mm and CD = 400mm. For static equilibrium of the mechanism determine the required input torque T_2 and link 2.
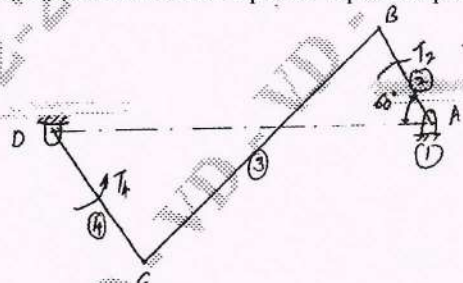

Fig Q1(b)   **(15 Marks)**

OR

2   a.   State the condition for static equilibrium of a body subjected to a system of i) two forces ii) three forces iii) member with two forces and a torque.   **(06 Marks)**

    b.   A horizontal gas engine running at 210 rpm has a bore of 220mm and a stroke of 440mm. The connecting rod is 924mm long and the reciprocating parts weigh 20kg. When the crank has turned through an angle of 30° from the inner dead centre, the gas pressure on the cover and crank sides are 500kN/m² and 60kN/m² respectively. Diameter of the piston rod is 40mm. Determine : i) Piston effort ii) thrust in the connecting rod iii) Turning moment on the crank shaft iv) thrust in the bearings.   **(14 Marks)**

Module-2

3   a.   Briefly explain the static and dynamic balancing.   **(04 Marks)**

    b.   A shaft carries four masses A, B, C and D of magnitude 200kg, 300kg, 400kg and 200kg respectively and revolving at radii 80mm, 70mm, 60mm and 80mm in a planes measured from A at 300mm, 400mm and 700mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes L and M. The distance between the planes A and L is 100mm between L and M is 400mm. If the balancing masses revolve at a radius of 100mm. Find their magnitudes and angular positions.   **(16 Marks)**

OR

4   The crank and connecting rods of a 4-cylinder inline engine running at 1800rpm are 60mm and 240mm each respectively and the cylinders are spaced 150mm apart. If the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at intervals of 90° in an end view in the order 1 – 4 – 2 – 3. The reciprocating mass in each cylinder is 1.5kg. Determine : i) unbalanced primary and secondary forces if any ii) unbalanced primary and secondary couples with reference to the central plane of the engine.   **(20 Marks)**

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Module-3

5   a.   Define the following terms relative to governors :
         i) Sensitiveness   ii) Isochronism   iii) Stability   iv) Power.   **(08 Marks)**
    b.   In a Hartnell governor, the extreme radii of rotation of the balls are 40mm and 60mm and
         the corresponding speeds are 210rpm and 230rpm. The mass of each ball is 3kg. The lengths
         of the ball and sleeve arms are equal. Determine: i) Spring load at minimum and maximum
         speeds ii) Spring stiffness iii) initial compression.   **(12 Marks)**

OR

6   a.   Derive an expression for gyroscopic couple $C = 1ww_p$.   **(05 Marks)**
    b.   The turbine rotor of a ship has a mass of 2200kg and rotates at 1800rpm clockwise.
         When viewed from the stern. The radius of gyration of rotor is 320mm. Determine the
         gyroscopic couple and its effect when the
         (i)   ship turns left at a radius of 250m with a speed of 25kmph
         (ii) ship pitches with the bow rising at an angular velocity of 0.8 rad/s
         (iii) ship rolls at an angular velocity of 0.1rad/s.   **(15 Marks)**

Module-4

7   a.   Briefly explain free, forced, damped and undamped vibration.   **(08 Marks)**
    b.   Split the harmonic motion $X = 10 \sin (wt + 30°)$ into two harmonic motions, one having a
         phase angle of zero degree and the other having phase angle of 45°. Also check the solution
         by graphically.   **(12 Marks)**

OR

8   a.   Determine the natural frequency of a spring mass system considering mass of the spring into
         account.   **(10 Marks)**
    b.   Find the natural frequency of the system shown in Fig Q8(b) by using Newton's method.
         Where m and r are the mass and radius of the disc.

Fig Q8(b)   **(10 Marks)**

Module-5

9   a.   Define logarithm decrement and derive an expression for the same interms of damping ratio.
         (10 Marks)
    b.   A vibration system consists of a mass of 50kg, a spring with a stiffness of 30kN/m and a
         damper. The damping provided is only 20% of the critical value. Determine the i) damping
         factor   ii) critical damping co-efficient   iii) natural frequency of damped vibrations
         iv) logarithmic decrement   v) ratio of two consecutive amplitudes.   **(10 Marks)**

OR

10 a.   Explain the terms :
         i) Magnification factor   ii) Transmissibility ratio   iii) Vibration isolation.   **(09 Marks)**
    b.   A machine of mass 1000kg is acted upon by an external force 2450N at a frequency of
         1500rpm. To reduce the effect of vibration, isolator of rubber having a static deflection of
         2mm under the machine load and an estimated damping factor of 0.2 are used. Determine:
         i) Transmissibility ratio ii) Force transmitted to the foundation iii) Amplitude of vibration
         iv) Phase log of the transmitted force with respect to the external force.   **(11 Marks)**

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USN | | | | | | | | | | **17ME753**

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Mechatronics

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Why mechatronics is important to industrial automation? Explain the applications of mechatronics. **(10 Marks)**
    b. What are the merits and demerits of mechatronics? **(10 Marks)**

OR

2 a. Define transducer and sensor. List the difference between transducer and sensors. **(08 Marks)**
    b. Explain light sensors, proximity switch and hall effect sensors. **(12 Marks)**

Module-2

3 a. Define microprocessor and microcontrollers. With the help of sketch, explain the application of micro processor to automobile system (car). **(10 Marks)**
    b. What are the elements of control systems? Mention the difference between microcontroller and microprocessor. **(10 Marks)**

OR

4 a. With the help of block diagram, explain microprocessor. **(08 Marks)**
    b. Draw a neat sketch of 8085 microprocessor. Explain different types of registers used in this processor. **(12 Marks)**

Module-3

5 a. Explain principle operation of Programmable Logic Controller (PLC). How PLC is different from microprocessor in control system. **(10 Marks)**
    b. What do you mean by ladder diagram? Explain the same with the help of an example. **(10 Marks)**

OR

6 a. Mention robot configuration. Explain yaw pitch and roll pertaining to robot, with the help of diagram. **(10 Marks)**
    b. Explain background of actuator in mechatronics system. Explain briefly typical hydraulic actuator and pneumatic actuator. **(10 Marks)**

Module-4

7 a. List the mechanical systems that transmits the power in different planes. **(06 Marks)**
    b. With the help of diagram, explain cams used in Internal Combustion (IC) engines. **(10 Marks)**
    c. List the mechanical aspects of motor selection. **(04 Marks)**

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OR

8 a. How relays are used in mechatronics application? Explain. Explain the working of solenoid switch.   **(08 Marks)**
   b. With the help of sketch, explain synchronous DC motor and servomotor.   **(12 Marks)**

Module-5

9 a. Classify the valves used in mechatronics systems. With the help of sketch, explain pressure reducing valve.   **(10 Marks)**
   b. Explain cylinders types. Explain rotary actuator.   **(10 Marks)**

OR

10 a. With the help of diagram and symbol, explain solenoid operated valve.   **(10 Marks)**
   b. Briefly explain design and function of various units of hydraulic system.   **(10 Marks)**

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USN | | | | | | | | | | | 15ME71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Energy Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What is pulverized coal? Explain with neat sketch overfeed and underfeed principle of coal firing. (12 Marks)
   b. List the advantages and limitations of pulverized coal. (04 Marks)

OR

2 a. With neat sketch explain the working principle of Benson boiler. (08 Marks)
   b. Define draught and explain the operation of induced draught system with neat sketch. (08 Marks)

Module-2

3 a. Draw the layout of Diesel engine power plant and explain its operation. (06 Marks)
   b. Describe the different methods of starting the Diesel engine. (06 Marks)
   c. Mention the application of Diesel engines in power field. (04 Marks)

OR

4 a. Explain briefly about
      i) Surge tank
      ii) Water hammer effect. (08 Marks)
   b. The runoff data of a river at a particular site is tabulated below :

Month	Mean in discharge per month in million of m³
Jan	40
February	25
March	20
April	10
May	0
June	50
July	75
August	100
September	110
October	60
November	50
December	40

   i) Draw the flow duration curve
   ii) Also draw hydrograph and find the mean flow (08 Marks)

Module-3

5 a. Explain with neat sketch working principle of solar pond electric power plant. (08 Marks)
   b. What is Solar radiation? Explain the working principle of pyranometer with neat sketch. (08 Marks)

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OR

6   a.   What is photovoltaic cell? Explain the principle of photo-voltaic conversion.   **(08 Marks)**

     b.   Calculate the Local Apparent Time (LAT) corresponding to 13.30hrs (IST) on July 16, 1998 at Delhi (28°35′ N 77°23′E). The equation at the time correction on July 16 is (−6) minutes. Indian Standard Time (IST) use the local civil time corresponding to 82°5′E longitude. Also calculate the declination.   **(08 Marks)**

Module-4

7   a.   Explain the method of harnessing wind energy using the horizontal axis wind machine with neat sketch.   **(08 Marks)**

     b.   Explain the method of harnessing tidal energy using the double basin system.   **(08 Marks)**

OR

8   a.   A horizontal shaft, propeller type wind turbine is located in area having the following wind characteristics.

         i)   Total power density in wind steam W/m^2

         ii)   Maximum possible obtainable power density in W/m^2

         iii)   Actual obtainable power density in W/m^2 assume 40% efficiency

         iv)   Total power from the wind turbine of 120m diameter.   **(08 Marks)**

     b.   Mention the difference between vertical and horizontal wind turbines.   **(08 Marks)**

Module-5

9   a.   Explain with neat sketch working principle of KVIC biogas digester.   **(08 Marks)**

     b.   What is anaerobic digestion? What are the factors which affect biodigestion.   **(08 Marks)**

OR

10   a.   Briefly explain Alkaline Fuel cell and Molten carbonate fuel cells.   **(08 Marks)**

     b.   Write short notes on Geothermal energy and state the advantages and limitations   **(08 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐   **15ME72**

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Fluid Power Systems

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 components required in a fluid power system with a diagram and list the advantages and applications.   **(08 Marks)**
    b. State Pascal's law. Explain its application with a diagram.   **(08 Marks)**

OR

2   a. How are hydraulic seats classified? Explain them in brief.   **(08 Marks)**
    b. What are the types of contaminants? Explain the sources of contamination. **(08 Marks)**

Module-2

3   a. A pump has a displacement volume of 100 cm^3. It delivers 1.5×10^{-3} m^3/sec at 1000 rpm and 70 bars. If the prime mover input torque is 120 N-m,
        (i)   What is the overall efficiency of the pump?
        (ii)   What is the theoretical torque required to operate the pump?   **(08 Marks)**
    b. What are the types of Accumulator? Explain with a neat circuit diagram the use of accumulator as a leakage compensator.   **(08 Marks)**

OR

4   a. Explain the operation of a Vane motor with a neat sketch.   **(08 Marks)**
    b. Explain single and double acting hydraulic cylinders with diagrams and their graphic symbols.   **(08 Marks)**

Module-3

5   a. Explain shuttle valve and check valve with diagrams.   **(08 Marks)**
    b. Explain the operation of pressure compensated flow control valve with a neat sketch. **(08 Marks)**

OR

6   a. Explain with a circuit diagram the working of double pump hydraulic system. **(08 Marks)**
    b. Explain with circuit diagrams the working of meter-in and meter-out for controlling of a speed of hydraulic cylinder.   **(08 Marks)**

Module-4

7   a. What are the advantages, limitations and applications of pneumatic system? **(08 Marks)**
    b. Explain with a neat diagram the working of a pneumatic cylinder cushioning. **(08 Marks)**

OR

8   a. Explain the working of Quick-exhaust valve with a diagram and an application circuit. **(08 Marks)**
    b. Explain the constructional features of a time-delay valve with a diagram and graphic symbol.   **(08 Marks)**

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Module-5

9 a. Explain the functions of 'OR' and 'AND' gates with shuttle and twin pressure valves respectively. **(08 Marks)**

   b. Explain with a neat circuit diagram in controlling of extension of a double acting cylinder using OR and AND logic gates. **(08 Marks)**

OR

10 a. Explain with neat circuit diagram signal elimination by reversing valves. **(08 Marks)**

   b. Explain the control circuitry for single and double acting cylinders using limit switches. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Control Engineering

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. What are the ideal requirements of a control system? Explain. **(08 Marks)**

    b. Explain the following controllers with the help of block diagrams and response curves:
(i) Proportional plus integral. (ii) Proportional plus integral plus derivative. **(08 Marks)**

OR

2 a. How control systems are broadly classified? Explain with the help of block diagrams and examples. **(08 Marks)**

    b. Compare and contrast proportional, integral and differential controllers. **(08 Marks)**

Module-2

3 a. For the physical system shown in Fig. Q3 (a), draw the Free Body diagram and write the system equations in time domain and S domain. **(10 Marks)**

Fig. Q3 (a)

    b. With usual notations, obtain the transfer function of a field controlled D.C. motor. **(06 Marks)**

OR

4 a. Obtain the control ratio C/R for the block diagram shown in Fig. Q4 (a). **(08 Marks)**

Fig. Q4 (a)

1 of 2

b. Find the transfer for the signal flow graph shown in Fig. Q4 (b) by using Mason's gain formula. **(08 Marks)**
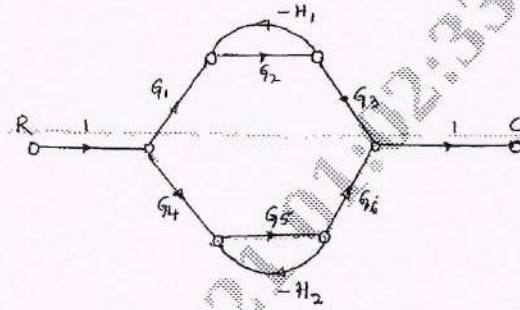

Fig. Q4 (b)

Module-3

5 a. With the help of a time response curve of a second order system, explain the following:
   (i) Delay time (ii) Rise time (iii) Peak time (iv) Settling time
   (v) Maximum over shoot **(08 Marks)**

   b. The open loop transfer function of a unity feedback system is $G(s) = \dfrac{4}{s(s+1)}$. Determine natural frequency, damped natural frequency, rise time, peak time, peak overshoot and settling time. **(08 Marks)**

OR

6 Sketch the root locus plot for the given system, $GH = \dfrac{K}{s(s+4)(s+2+2J)(s+2-2J)}$ and determine the range of K for which the system remains stable. **(16 Marks)**

Module-4

7 a. State and explain Nyquist stability criteria. **(04 Marks)**

   b. Draw the complete Nyquist plot for the system whose open loop transfer function is given by, $GH = \dfrac{K}{s(1+0.1s)(1+0.5s)}$. Determine the range 'K' for which the system is stable. **(12 Marks)**

OR

8 The open loop transfer function of a unity feedback control system is:
$$G(s) = \dfrac{90(1+0.5s)}{(1+0.1s)(1+2s)(1+0.02s)}.$$
Draw Bode plot and determine phase margin and gain margin. **(16 Marks)**

Module-5

9 a. What are the types of compensation? Explain with the help of simple block diagrams. **(08 Marks)**

   b. What are the characteristics of lead compensator? Explain a simple lead compensator with simple diagram. **(08 Marks)**

OR

10 a. Define controllability. What is Kalman's test for controllability and observability? **(06 Marks)**

   b. Using Kalman's test, determine the controllability of the following system:
$$\begin{bmatrix} \dot{x_1} \\ \dot{x_2} \\ \dot{x_3} \end{bmatrix} = \begin{bmatrix} -2 & 1 & 2 \\ 4 & 0 & 3 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 & 4 \\ -5 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$
(10 Marks)

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2 of 2

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

USN ☐☐☐☐☐☐☐☐☐☐

15ME742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Tribology

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1 a. What are the desirable properties of Lubricating oil? **(06 Marks)**
   b. Discuss the effect of temperature and pressure on viscosity. **(06 Marks)**
   c. Discuss the purpose of lubrication. **(04 Marks)**

OR

2 a. Discuss the types of lubricant and the applications. **(06 Marks)**
   b. Write a note on selection of lubricants. **(06 Marks)**
   c. Discuss the important application of tribology. **(04 Marks)**

Module-2

3 a. With a neat sketch, explain the measurement of friction by pin on disc equipment. **(08 Marks)**
   b. Explain adhesion theory of friction by Bowden and Tabor. Also list the limitations. **(08 Marks)**

OR

4 a. Define Wear. Discuss the different types of wear with neat sketches. **(10 Marks)**
   b. Write a note on wear of ceramic materials. **(06 Marks)**

Module-3

5 a. Derive the Petroff's equation for a lightly loaded bearing. Also indicate the assumption made. **(08 Marks)**
   b. A full journal bearing has the following specification, shaft diameter 45mm, bearing length 65mm, radial clearance is 0.0015, speed 2800 rpm, radial load 800N, viscosity of lubricant at effective temperature is 8.27×10^{-3} Pa.S. Considering the bearing as lightly loaded, determine i) Friction torque at the shaft   ii) Co-efficient of friction   iii) Power loss. **(08 Marks)**

OR

6 Derive Reynold's equation in 2D [two – dimension]. Also state the assumption made. **(16 Marks)**

Module-4

7 a. Derive an expression for load carrying capacity of a plane slider bearing with fixed shoe. **(10 Marks)**
   b. A rectangular plain slider bearing with fixed shoe and with no end leakage has the following data :
   i) Bearing length – 90mm   ii) Width of shoe – 90mm   iii) Load on bearing – 7800N.
   iv) Slider velocity – 250×10^{-2} mts/sec   v) Inclination $\alpha = -0.00035$ radians
   vi) Viscosity of oil $\eta = 40$ Cp.
   Determine I) Minimum film thickness   II) Power loss   III) Co-efficient of friction. **(06 Marks)**

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

OR

8 a. Derive an expression for load carrying capacity of hydrostatic step bearing. Also state the assumption made. **(10 Marks)**

   b. A hydrostatic circular thrust bearing has the following data : Shaft diameter = 300mm , Diameter of pocket = 200mm ; Shaft speed = 100 rpm ; Pressure at the pocket = 500kN/m^2 ; Film thickness = 0.07mm ; Viscosity of lubricant = 0.05Pas. Determine i) Load carrying capacity ii) Oil flow rate   iii) Power loss due to friction. **(06 Marks)**

Module-5

9 a. Describe briefly the desirable properties of a bearing material. **(08 Marks)**

   b. Explain briefly the commonly used bearing alloys. **(08 Marks)**

OR

10 a. What are the various modes by which surface properties can be enhanced? **(08 Marks)**

    b. With a neat sketch, explain laser cladding. **(08 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

USN | | | | | | | | | | **15ME73**

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Control Engineering

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. What are the ideal requirements of a control system? Explain. **(08 Marks)**
   b. Explain the following controllers with the help of block diagrams and response curves:
      (i) Proportional plus integral (ii) Proportional plus integral plus derivative. **(08 Marks)**

OR

2 a. How control systems are broadly classified? Explain with the help of block diagrams and examples. **(08 Marks)**
   b. Compare and contrast proportional, integral and differential controllers. **(08 Marks)**

Module-2

3 a. For the physical system shown in Fig. Q3 (a), draw the Free Body diagram and write the system equations in time domain and S domain. **(10 Marks)**
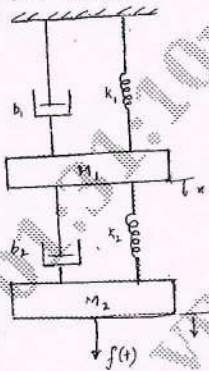

Fig. Q3 (a)

   b. With usual notations, obtain the transfer function of a field controlled D.C. motor. **(06 Marks)**

OR

4 a. Obtain the control ratio C/R for the block diagram shown in Fig. Q4 (a). **(08 Marks)**
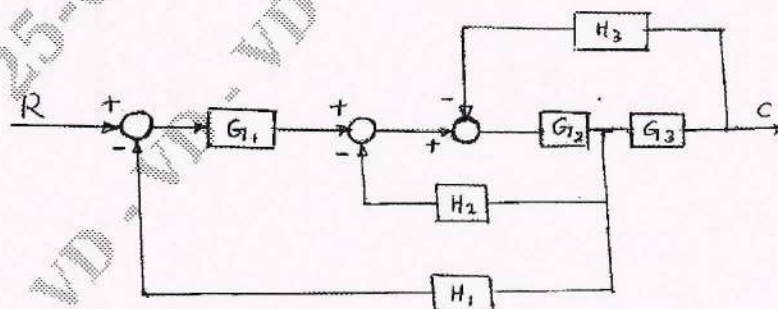

Fig. Q4 (a)

1 of 2

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

b. Find the transfer for the signal flow graph shown in Fig. Q4 (b) by using Mason's gain formula. (08 Marks)
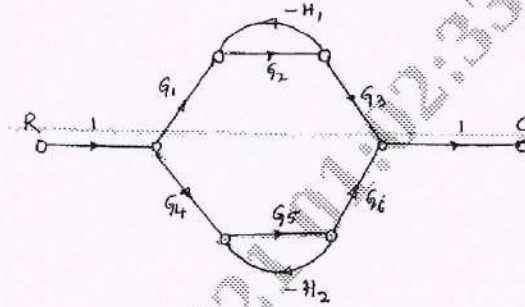

Fig. Q4 (b)

Module-3

5 a. With the help of a time response curve of a second order system, explain the following:
(i) Delay time   (ii) Rise time   (iii) Peak time   (iv) Settling time
(v) Maximum over shoot (08 Marks)

b. The open loop transfer function of a unity feedback system is $G(s) = \dfrac{4}{s(s+1)}$. Determine natural frequency, damped natural frequency, rise time, peak time, peak overshoot and settling time. (08 Marks)

OR

6 Sketch the root locus plot for the given system, $GH = \dfrac{K}{s(s+4)(s+2+2J)(s+2-2J)}$

and determine the range of K for which the system remains stable. (16 Marks)

Module-4

7 a. State and explain Nyquist stability criteria. (04 Marks)

b. Draw the complete Nyquist plot for the system whose open loop transfer function is given by, $GH = \dfrac{K}{s(1+0.1s)(1+0.5s)}$. Determine the range 'K' for which the system is stable.

(12 Marks)

OR

8 The open loop transfer function of a unity feedback control system is:

$G(s) = \dfrac{90(1+0.5s)}{(1+0.1s)(1+2s)(1+0.02s)}$.

Draw Bode plot and determine phase margin and gain margin. (16 Marks)

Module-5

9 a. What are the types of compensation? Explain with the help of simple block diagrams. (08 Marks)

b. What are the characteristics of lead compensator? Explain a simple lead compensator with simple diagram. (08 Marks)

OR

10 a. Define controllability. What is Kalman's test for controllability and observability? (06 Marks)

b. Using Kalman's test, determine the controllability of the following system:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -2 & 1 & 2 \\ 4 & 0 & 3 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 & 4 \\ -5 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

(10 Marks)

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Eighth Semester B.E. Degree Examination, Jan./Feb. 202
Renewable Energy Sources

Time: 3 hrs.   Max.]

Note: *Answer any FIVE full questions, selecting at least TWO questions from*

PART – A

1 a. What are primary and Secondary energy sources?
   b. Explain the significance of Energy Consumption as a measure of prosperity.
   c. What are the Conventional and non-Conventional Energy Sources? Describe br
       the advantages of Renewable energy.

2 a. Define the following terms:
       i)Solar Azimuth angle   ii) Surface Azimuth angle   iii) Solar Altitude
       iv) Zenith angle (θ_z)   v) Declination angle
   b. Determine the Local Solar time and declination at a location latitude $23^0 15'$
       $77^0 30'$E at 12-30 IST on June 19. Equation of time Correction is given fr
       chart= -(1'01").
   c. What is the difference between a Pyrheliometer and a Pyronometer. Describe
       of Angstrom type Pyrheliometer.

3 a. What are the main Components of a blot-plate Solar Collector. Explain wit
       working principle and function of each components.
   b. With a neat Sketch Explain the following:
       i)Solar Cooker   ii) Solar Green Houses

4 a. Explain with a neat diagram Solar Pond electric power plant with cooling tower
   b. Write Short Notes on:
       i)Solar water pumping system
       ii)Methods of energy storage (Block diagram representation)

PART – B

5 a. Prove that in case of horizontal axis wind turbine maximum power can be ob
       Exit Velocity=$\frac{1}{3}$ Wind Velocity and $P_{max} = \frac{8}{27g.c}\rho AV_i^3$
   b. Describe with a neat sketch the working of a Wind Energy Conversion System (
       main Components.

6 a. What is Pyrolysis? Explain with a neat figure Small Scale Pyrolysis Unit.
   b. Explain the Constructional detail and working of KVIC digester.

c. The observed difference between the high and low water tide is 8.5m, for a p site. The basin area is about 0.5sq km which can generate power for 3 hours i The average available head is assumed to be 8m, and the overall efficiency of tl to be 70%. Calculate the power in h.p at any instant and the yearly output. Ave Weight of sea water is assumed to be 1025kg/mt^3.

8 a. Explain with the help of Block diagram the main components of Fuel Cell Syste

   b. What are the advantages and limitations of Small Scale Hydro electric powe:

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CBCS SCHEME

17ME71

USN ☐☐☐☐☐☐☐☐☐☐

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Energy Engineering

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1 a. Explain the principle of over feed stokes with neat diagram. **(10 Marks)**
　 b. Explain Hydraulic ash handling process, with a neat sketch. **(10 Marks)**

OR

2 a. A chimney is 28m height and temperature of hot gases inside is 320^0C. The temperature of outside air is 23^0C and furnace is supplied with 15kg of air per kg of coal burnt. Calculate
　　 i) Draught in mm of water　　ii) Draught head in meters of hot gases. **(10 Marks)**
　 b. Explain the central or bin system of burning pulverised coal. **(10 Marks)**

Module-2

3 a. With a neat diagram, explain the general layout of diesel power plant. **(10 Marks)**
　 b. Explain the general layout of hydroelectric power plant, with a neat diagram. **(10 Marks)**

OR

4 a. Classify the hydroelectric power plants on the basis of head. Explain each type of plant in detail. **(10 Marks)**
　 b. With a neat diagram, explain Pump Fuel injection system. **(10 Marks)**

Module-3

5 a. Explain Pyranometer with neat sketch to measure beam and diffused radiations. **(10 Marks)**
　 b. With a neat diagram, explain typical solar flat plate collector. **(10 Marks)**

OR

6 a. What are the main advantages of solar – cell? Explain the conversion of solar energy to electricity through photovoltaic cell. **(10 Marks)**
　 b. Explain Phase change (Latent heat) heat storage concept. Explain the properties of materials used in latent heat storage. Comment on Latent heat storage materials. **(10 Marks)**

Module-4

7 a. Derive an expression for the power of wind mill with condition. **(10 Marks)**
　 b. With neat diagram, explain Single basin storage Tidal Power Plant and also comment on the advantages of Tidal Power Plant (Tidal). **(10 Marks)**

OR

8 a. Explain the typical horizontal axis wind mill, with a neat sketch. **(10 Marks)**
　 b. What are the different resources that can be used as Biomass for biogas generation? **(10 Marks)**

Module-5

9 a. Describe the photosynthesis process with relevant chemical reactions. Also explain the importance of photosynthesis in biofuel generation. **(10 Marks)**
　 b. Explain closed Rankine cycle OTEC system with neat sketch. **(10 Marks)**

OR

10 a. Explain with a neat sketch, the water dominated Geothermal system. **(10 Marks)**
　 b. What is the work of fuel cell? Explain typical H_2O_2 fuel cell with a neat sketch. **(10 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

USN ☐☐☐☐☐☐☐☐☐☐   **17ME72**

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Fluid Power Systems

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1. a. What are the various applications of fluid power systems?   (05 Marks)
   b. State Pascal's law and mention the various advantages of fluid power systems.   (05 Marks)
   c. Explain the various components used in hydraulic systems and its symbol.   (10 Marks)

OR

2. a. Describe the various functions of hydraulic fluids and its types.   (05 Marks)
   b. Define the fluid properties such as viscosity, viscosity index, pour point, fire point, flash point.   (05 Marks)
   c. Explain the working of return line and suction line filtering with the aid of sketches.   (10 Marks)

Module-2

3. a. What are the various types of positive displacement pump used in fluid power system?   (05 Marks)
   b. Explain with a sketch the construction and working of bladder type accumulator used in fluid power system.   (05 Marks)
   c. Explain the construction and working of external gear pump with a neat sketch.   (10 Marks)

OR

4. a. Explain the construction and working of double acting cylinder with a neat sketch. (05 Marks)
   b. An 8 cm diameter hydraulic cylinder has a 4 cm diameter rod. If the cylinder receives flow at 100 LPM and 12 MPa. Find the
      (i)   Extension and retraction speeds.
      (ii)   Extension and retraction load carrying.   (05 Marks)
   c. Explain the construction and working of a hydraulic cylinder cushioning with a neat sketch. Also draw symbol.   (10 Marks)

Module-3

5. a. List various types of control valves.   (03 Marks)
   b. With a neat sketch explain the working of pressure relief valve.   (07 Marks)
   c. Explain the hydraulic regenerative circuit with a neat sketch.   (10 Marks)

OR

6. a. With a neat sketch, explain the working of ball type check valve.   (05 Marks)
   b. With a neat sketch, explain the working of the 4/2 manually operated direction control valve.   (05 Marks)
   c. Explain the hydraulic cylinder sequencing circuits with a neat sketch.   (10 Marks)

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

Module-4

7 a. Describe the various components used in pneumatic power systems and its symbol.
(05 Marks)

   b. Explain the working of a single acting type of pneumatic cylinder with a neat sketch.
(05 Marks)

   c. Explain the construction and working of lubricator used in pneumatic system with a neat sketch.
(10 Marks)

OR

8 a. Explain the working of a shuttle valve used in pneumatic system with a neat sketch.
(05 Marks)

   b. What are the various ways the pneumatic cylinders are mounted?
(05 Marks)

   c. Explain the working of solenoid operated valve with a neat sketch.
(10 Marks)

Module-5

9 a. Explain the speed control pneumatic circuits with a suitable sketch.
(10 Marks)

   b. Explain the OR function of controlling the single acting pneumatic cylinder with a neat circuit.
(10 Marks)

OR

10 a. Explain the controlling of pneumatic cylinders in a sequence as $A^+ B^+ B^- A^-$ by cascading method.
(10 Marks)

   b. Explain electro pneumatic control of double acting cylinder with a suitable circuit. (10 Marks)

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17ME73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Control Engineering

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. What is closed loop control system? (02 Marks)
   b. Explain the closed loop control system with an example. (08 Marks)
   c. Describe proportional + Integral + Derivative control system with its characteristics. (10 Marks)

OR

2 a. What are the requirements of an ideal control system? Explain any three in detail. (10 Marks)
   b. Explain :
      i) Proportional control system
      ii) Proportional and integral control system. (10 Marks)

Module-2

3 a. Find the transfer function of mechanical system shown in Fig.Q3(a).
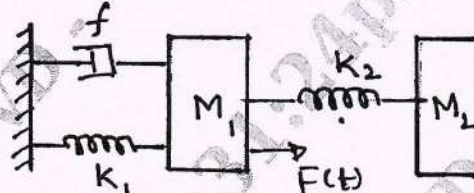

Fig.Q3(a) (10 Marks)

   b. Draw the signal flow graph for the following set of equations and obtain the transfer function:

$x_2 = a_{12} x_1 + a_{32} x_3 + a_{42} x_4 + a_{52} x_5$

$x_3 = a_{23} x_2$

$x_4 = a_{34} x_3 + a_{44} x_4$

$x_5 = a_{35} x_3 + a_{45} x_4$ (10 Marks)

OR

4 a. Derive the differential equation of first order electrical system. (05 Marks)
   b. A gas filled thermometer has a thermal resistance of R and is filled with a gas whose thermal capacitance is C. Obtain the transfer function relating the temperature of the gas inside the thermometer to the temperature of the medium in which the thermometer is inserted. Neglect capilarity of the thermometer. (05 Marks)
   c. Determine the transfer function of the system shown in Fig.Q4(c), by block diagram reduction method.
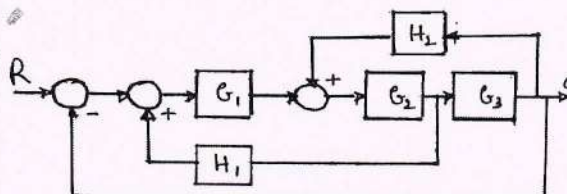

Fig.Q4(c) (10 Marks)

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

Module-3

5 a. A unity feedback control system has $G(s) = \dfrac{25}{s(s+5)}$. Determine the following quantities if it is subjected to unit step input
i)   Rise time
ii) Peak time
iii) Maximum over shoot
iv) Settling time for 2% tolerance. **(08 Marks)**

   b. Define : i) Absolute stability   ii) Relative stability. **(04 Marks)**

   c. Investigate the stability of the control system using R–H criteria. The characteristic equation is $s^4 + 2s^3 + 11s^2 + 18s + 18 = 0$. **(08 Marks)**

OR

6 Sketch the root locus plot for a system whose open loop transfer function :
$$G(s)H(s) = \frac{K[s^2 + 6s + 25]}{s[s+1][s+2]}$$
Show that the system is absolutely stable. **(20 Marks)**

Module-4

7 Draw the BODE plots for the system having the open loop transfer function :
$$G(s)H(s) = \frac{K}{s[s^2 + 2s + 5]}.$$
Determine the value of K to obtain
i)   A phase margin of 50° ii) A gain margin of 10db. **(20 Marks)**

OR

8 Determine the stability of the open loop control system
$$G(s)H(s) = \frac{10[s+1]}{s[s-1][s+5]}$$ using Nyquist method. **(20 Marks)**

Module-5

9 a. Explain phase lead compensation. **(08 Marks)**

   b. Define : i) State variables ii) State vector. **(04 Marks)**

   c. Evaluate the observability of the system with $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ and $C = [3\ 4\ 1]$

Using Gilbertz test. **(08 Marks)**

OR

10 a. Explain phase lag compensation. **(08 Marks)**

   b. What are the advantages of state variable analysis? **(04 Marks)**

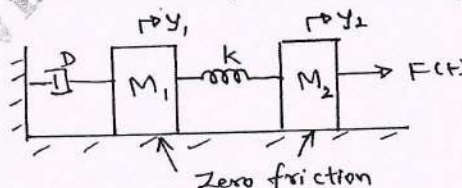   c. Obtain the state equation for the mechanical system shown in Fig.Q10(c).

Fig.Q10(c) **(08 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

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17ME742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Tribology

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1　a. Briefly explain history of Tribology.　　　　　　　　　　　　　　(06 Marks)
　　b. Discuss the effect of pressure and temperature on viscosity.　　　(08 Marks)
　　c. Write a note on selection of lubricants.　　　　　　　　　　　　(06 Marks)

OR

2　a. State and prove Hasen-Poiseuille Law.　　　　　　　　　　　　　(10 Marks)
　　b. With a neat sketch, explain saybolt viscometer.　　　　　　　　　(10 Marks)

Module-2

3　a. Define the term friction. Explain the measurement of friction by tilted plane method.
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(10 Marks)
　　b. Explain Bowden and Tabor's adhesion theory of friction.　　　　　(10 Marks)

OR

4　a. Define wear; briefly explain different types of wear.　　　　　　　(10 Marks)
　　b. Explain the Delamination theory of wear.　　　　　　　　　　　(10 Marks)

Module-3

5　a. Derive the Petroff's equations for a lightly loaded journal bearing. Also state the assumptions made.　　　　　　　　　　　　　　　　　　　(10 Marks)
　　b. A full journal bearing have the following specifications, shaft diameter 45mm, bearing length 65mm, radial clearance ratio is 0.0015, speed 2800rpm, radial load 800N, viscosity of the lubricant 8.27×10^{-3} PaS. The bearing is lightly loaded, determine :
　　　　i) Friction torque at the shaft
　　　　ii) Co-efficient of friction
　　　　iii) Power loss.　　　　　　　　　　　　　　　　　　　　　(10 Marks)

OR

6　Derive the Reynold's equation in two dimension. Also state the assumption made. (20 Marks)

Module-4

7　a. Derive an expression for the load carrying capacity of a plane slider bearing with fixed shoe.
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(10 Marks)
　　b. Slider bearing with pivoted shoe has the following specifications, B = 0.0508mts, L = 0.0625mts, U = 5.58 mts/sec, W = 8006.4N, η = 0.03 N-s/m². Determine :
　　　i) Minimum film thickness　　ii) Power loss angle of inclination corresponds to minimum co-efficient of frictions.　　　　　　　　　　　　　　　　　　　(10 Marks)

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

OR

8 a. Derive the expression for load carrying capacity and rate of flow of oil through a hydro-static step bearing. **(10 Marks)**

   b. A hydrostate circular thrust bearing has the following data. Shaft diameter = 300mm, diameter of packet = 200mm, shaft speed = 100rpm, Pressure at the pocket = 500kN/m^2, film thickness = 0.07mm, viscosity of lubricant = 0.05Pas. Determine :
   i) Load carrying capacity
   ii) Oil flow rate
   iii) Power Loss due to friction. **(10 Marks)**

Module-5

9 a. Briefly discuss any ten desirable properties of a good bearing materials. **(10 Marks)**

   b. Briefly discuss the common bearing materials that are used in practice. **(10 Marks)**

OR

10 a. Briefly explain the various mode by which surface properties can be enhanced. **(10 Marks)**

    b. Briefly explain different techniques to achieve surface modifications. **(10 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

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17ME52

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Dynamics of Machinery

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1   a. What is free body diagram? Explain with simple sketches.   (05 Marks)
    b. In a 4 bar link mechanism shown in Fig Q1(b) the link 4 subjected to a torque $T_4 = 20$N-m. The link length are AD = 800mm, AB = 300mm, BC = 700mm and CD = 400mm. For static equilibrium of the mechanism determine the required input torque T_2 and link 2.

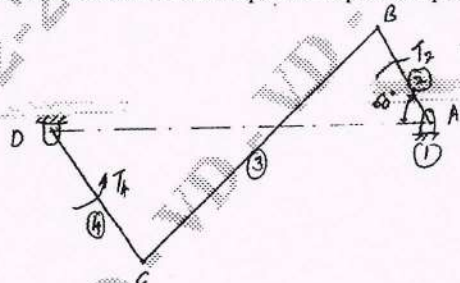Fig Q1(b)   (15 Marks)

OR

2   a. State the condition for static equilibrium of a body subjected to a system of i) two forces ii) three forces   iii) member with two forces and a torque.   (06 Marks)
    b. A horizontal gas engine running at 210 rpm has a bore of 220mm and a stroke of 440mm. The connecting rod is 924mm long and the reciprocating parts weigh 20kg. When the crank has turned through an angle of 30° from the inner dead centre, the gas pressure on the cover and crank sides are 500kN/m² and 60kN/m² respectively. Diameter of the piston rod is 40mm. Determine : i) Piston effort ii) thrust in the connecting rod   iii) Turning moment on the crank shaft iv) thrust in the bearings.   (14 Marks)

Module-2

3   a. Briefly explain the static and dynamic balancing.   (04 Marks)
    b. A shaft carries four masses A, B, C and D of magnitude 200kg, 300kg, 400kg and 200kg respectively and revolving at radii 80mm, 70mm, 60mm and 80mm in a planes measured from A at 300mm, 400mm and 700mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes L and M. The distance between the planes A and L is 100mm between L and M is 400mm. If the balancing masses revolve at a radius of 100mm. Find their magnitudes and angular positions.   (16 Marks)

OR

4   The crank and connecting rods of a 4-cylinder inline engine running at 1800rpm are 60mm and 240mm each respectively and the cylinders are spaced 150mm apart. If the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at intervals of 90° in an end view in the order 1 – 4 – 2 – 3. The reciprocating mass in each cylinder is 1.5kg. Determine : i) unbalanced primary and secondary forces if any   ii) unbalanced primary and secondary couples with reference to the central plane of the engine.   (20 Marks)

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Module-3

5 a. Define the following terms relative to governors :
       i) Sensitiveness   ii) Isochronism   iii) Stability   iv) Power. **(08 Marks)**

   b. In a Hartnell governor, the extreme radii of rotation of the balls are 40mm and 60mm and the corresponding speeds are 210rpm and 230rpm. The mass of each ball is 3kg. The lengths of the ball and sleeve arms are equal. Determine: i) Spring load at minimum and maximum speeds ii) Spring stiffness iii) initial compression. **(12 Marks)**

OR

6 a. Derive an expression for gyroscopic couple $C = 1ww_p$. **(05 Marks)**

   b. The turbine rotor of a ship has a mass of 2200kg and rotates at 1800rpm clockwise. When viewed from the stern. The radius of gyration of rotor is 320mm. Determine the gyroscopic couple and its effect when the
       (i)   ship turns left at a radius of 250m with a speed of 25kmph
       (ii) ship pitches with the bow rising at an angular velocity of 0.8 rad/s
       (iii) ship rolls at an angular velocity of 0.1rad/s **(15 Marks)**

Module-4

7 a. Briefly explain free, forced, damped and undamped vibration. **(08 Marks)**

   b. Split the harmonic motion $X = 10 \sin(wt + 30°)$ into two harmonic motions, one having a phase angle of zero degree and the other having phase angle of 45°. Also check the solution by graphically. **(12 Marks)**

OR

8 a. Determine the natural frequency of a spring mass system considering mass of the spring into account. **(10 Marks)**

   b. Find the natural frequency of the system shown in Fig Q8(b) by using Newton's method. Where m and r are the mass and radius of the disc.
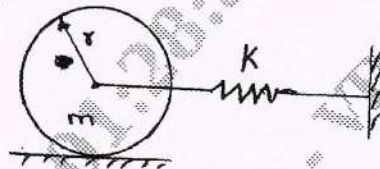

Fig Q8(b) **(10 Marks)**

Module-5

9 a. Define logarithm decrement and derive an expression for the same interms of damping ratio. **(10 Marks)**

   b. A vibration system consists of a mass of 50kg, a spring with a stiffness of 30kN/m and a damper. The damping provided is only 20% of the critical value. Determine the i) damping factor ii) critical damping co-efficient iii) natural frequency of damped vibrations iv) logarithmic decrement v) ratio of two consecutive amplitudes. **(10 Marks)**

OR

10 a. Explain the terms :
       i) Magnification factor ii) Transmissibility ratio iii) Vibration isolation. **(09 Marks)**

   b. A machine of mass 1000kg is acted upon by an external force 2450N at a frequency of 1500rpm. To reduce the effect of vibration, isolator of rubber having a static deflection of 2mm under the machine load and an estimated damping factor of 0.2 are used. Determine:
       i) Transmissibility ratio ii) Force transmitted to the foundation iii) Amplitude of vibration iv) Phase log of the transmitted force with respect to the external force. **(11 Marks)**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Mechatronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Why mechatronics is important to industrial automation? Explain the applications of mechatronics. **(10 Marks)**
   b. What are the merits and demerits of mechatronics? **(10 Marks)**

OR

2 a. Define transducer and sensor. List the difference between transducer and sensors. **(08 Marks)**
   b. Explain light sensors, proximity switch and hall effect sensors. **(12 Marks)**

Module-2

3 a. Define microprocessor and microcontrollers. With the help of sketch, explain the application of micro processor to automobile system (car). **(10 Marks)**
   b. What are the elements of control systems? Mention the difference between microcontroller and microprocessor. **(10 Marks)**

OR

4 a. With the help of block diagram, explain microprocessor. **(08 Marks)**
   b. Draw a neat sketch of 8085 microprocessor. Explain different types of registers used in this processor. **(12 Marks)**

Module-3

5 a. Explain principle operation of Programmable Logic Controller (PLC). How PLC is different from microprocessor in control system. **(10 Marks)**
   b. What do you mean by ladder diagram? Explain the same with the help of an example. **(10 Marks)**

OR

6 a. Mention robot configuration. Explain yaw pitch and roll pertaining to robot, with the help of diagram. **(10 Marks)**
   b. Explain background of actuator in mechatronics system. Explain briefly typical hydraulic actuator and pneumatic actuator. **(10 Marks)**

Module-4

7 a. List the mechanical systems that transmits the power in different planes. **(06 Marks)**
   b. With the help of diagram, explain cams used in Internal Combustion (IC) engines. **(10 Marks)**
   c. List the mechanical aspects of motor selection. **(04 Marks)**

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OR

8 a. How relays are used in mechatronics application? Explain. Explain the working of solenoid switch. **(08 Marks)**

   b. With the help of sketch, explain synchronous DC motor and servomotor. **(12 Marks)**

Module-5

9 a. Classify the valves used in mechatronics systems. With the help of sketch, explain pressure reducing valve. **(10 Marks)**

   b. Explain cylinders types. Explain rotory actuator. **(10 Marks)**

OR

10 a. With the help of diagram and symbol, explain solenoid operated valve. **(10 Marks)**

   b. Briefly explain design and function of various units of hydraulic system. **(10 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Energy Engineering

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. What is pulverized coal? Explain with neat sketch overfeed and underfeed principle of coal firing.   **(12 Marks)**
   b. List the advantages and limitations of pulverized coal.   **(04 Marks)**

OR

2 a. With neat sketch explain the working principle of Benson boiler.   **(08 Marks)**
   b. Define draught and explain the operation of induced draught system with neat sketch.
                                                                                    (08 Marks)

Module-2

3 a. Draw the layout of Diesel engine power plant and explain its operation.   **(06 Marks)**
   b. Describe the different methods of starting the Diesel engine.   **(06 Marks)**
   c. Mention the application of Diesel engines in power field.   **(04 Marks)**

OR

4 a. Explain briefly about
       i) Surge tank
       ii) Water hammer effect.   **(08 Marks)**
   b. The runoff data of a river at a particular site is tabulated below :

Month	Mean in discharge per month in million of m^3
Jan	40
February	25
March	20
April	10
May	0
June	50
July	75
August	100
September	110
October	60
November	50
December	40

       i) Draw the flow duration curve
       ii) Also draw hydrograph and find the mean flow   **(08 Marks)**

Module-3

5 a. Explain with neat sketch working principle of solar pond electric power plant. **(08 Marks)**
   b. What is Solar radiation? Explain the working principle of pyranometer with neat sketch.
                                                                                    (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

6 a. What is photovoltaic cell? Explain the principle of photo-voltaic conversion. **(08 Marks)**

b. Calculate the Local Apparent Time (LAT) corresponding to 13.30hrs (IST) on July 16, 1998 at Delhi (28°35′ N 77°23′E). The equation at the time correction on July 16 is (−6) minutes. Indian Standard Time (IST) use the local civil time corresponding to 82°5′E longitude. Also calculate the declination. **(08 Marks)**

Module-4

7 a. Explain the method of harnessing wind energy using the horizontal axis wind machine with neat sketch. **(08 Marks)**

b. Explain the method of harnessing tidal energy using the double basin system. **(08 Marks)**

OR

8 a. A horizontal shaft, propeller type wind turbine is located in area having the following wind characteristics.
i) Total power density in wind steam W/m^2
ii) Maximum possible obtainable power density in W/m^2
iii) Actual obtainable power density in W/m^2 assume 40% efficiency
iv) Total power from the wind turbine of 120m diameter. **(08 Marks)**

b. Mention the difference between vertical and horizontal wind turbines. **(08 Marks)**

Module-5

9 a. Explain with neat sketch working principle of KVIC biogas digester. **(08 Marks)**

b. What is anaerobic digestion? What are the factors which affect biodigestion. **(08 Marks)**

OR

10 a. Briefly explain Alkaline Fuel cell and Molten carbonate fuel cells. **(08 Marks)**

b. Write short notes on Geothermal energy and state the advantages and limitations **(08 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   **15ME72**

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Fluid Power Systems

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 components required in a fluid power system with a diagram and list the advantages and applications. **(08 Marks)**
   b. State Pascal's law. Explain its application with a diagram. **(08 Marks)**

OR

2 a. How are hydraulic seats classified? Explain them in brief. **(08 Marks)**
   b. What are the types of contaminants? Explain the sources of contamination. **(08 Marks)**

Module-2

3 a. A pump has a displacement volume of 100 cm^3. It delivers 1.5×10^{-3} m^3/sec at 1000 rpm and 70 bars. If the prime mover input torque is 120 N-m,
      (i)   What is the overall efficiency of the pump?
      (ii) What is the theoretical torque required to operate the pump? **(08 Marks)**
   b. What are the types of Accumulator? Explain with a neat circuit diagram the use of accumulator as a leakage compensator. **(08 Marks)**

OR

4 a. Explain the operation of a Vane motor with a neat sketch. **(08 Marks)**
   b. Explain single and double acting hydraulic cylinders with diagrams and their graphic symbols. **(08 Marks)**

Module-3

5 a. Explain shuttle valve and check valve with diagrams. **(08 Marks)**
   b. Explain the operation of pressure compensated flow control valve with a neat sketch. **(08 Marks)**

OR

6 a. Explain with a circuit diagram the working of double pump hydraulic system. **(08 Marks)**
   b. Explain with circuit diagrams the working of meter-in and meter-out for controlling of a speed of hydraulic cylinder. **(08 Marks)**

Module-4

7 a. What are the advantages, limitations and applications of pneumatic system? **(08 Marks)**
   b. Explain with a neat diagram the working of a pneumatic cylinder cushioning. **(08 Marks)**

OR

8 a. Explain the working of Quick-exhaust valve with a diagram and an application circuit. **(08 Marks)**
   b. Explain the constructional features of a time-delay valve with a diagram and graphic symbol. **(08 Marks)**

Module-5

9 a. Explain the functions of 'OR' and 'AND' gates with shuttle and twin pressure valves respectively. **(08 Marks)**

   b. Explain with a neat circuit diagram in controlling of extension of a double acting cylinder using OR and AND logic gates. **(08 Marks)**

OR

10 a. Explain with neat circuit diagram signal elimination by reversing valves. **(08 Marks)**

    b. Explain the control circuitry for single and double acting cylinders using limit switches. **(08 Marks)**

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USN | | | | | | | | | | **15ME73**

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Control Engineering

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. What are the ideal requirements of a control system? Explain.   **(08 Marks)**
   b. Explain the following controllers with the help of block diagrams and response curves:
       (i) Proportional plus integral. (ii) Proportional plus integral plus derivative.   **(08 Marks)**

OR

2 a. How control systems are broadly classified? Explain with the help of block diagrams and examples.   **(08 Marks)**
   b. Compare and contrast proportional, integral and differential controllers.   **(08 Marks)**

Module-2

3 a. For the physical system shown in Fig. Q3 (a), draw the Free Body diagram and write the system equations in time domain and S domain.   **(10 Marks)**
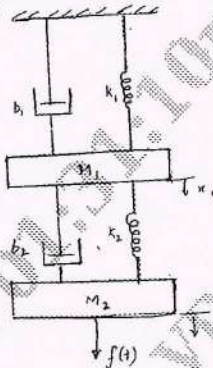

Fig. Q3 (a)

   b. With usual notations, obtain the transfer function of a field controlled D.C. motor. **(06 Marks)**

OR

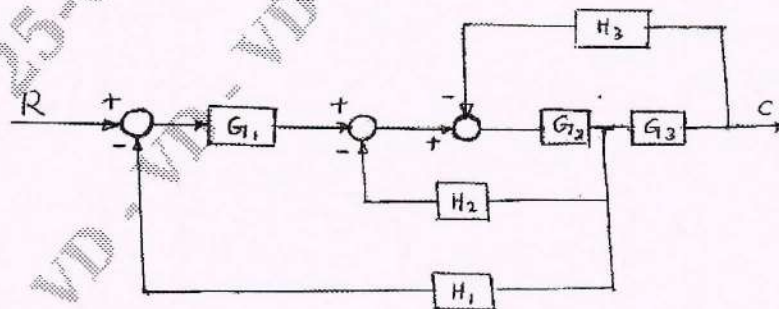4 a. Obtain the control ratio C/R for the block diagram shown in Fig. Q4 (a).   **(08 Marks)**

Fig. Q4 (a)

1 of 2

KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

b. Find the transfer for the signal flow graph shown in Fig. Q4 (b) by using Mason's gain formula. **(08 Marks)**
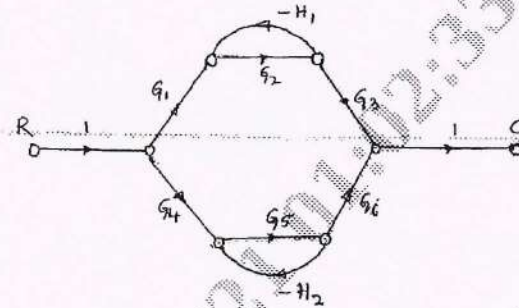

Fig. Q4 (b)

Module-3

5 a. With the help of a time response curve of a second order system, explain the following:
 (i) Delay time   (ii) Rise time   (iii) Peak time   (iv) Settling time
 (v) Maximum over shoot. **(08 Marks)**

 b. The open loop transfer function of a unity feedback system is $G(s) = \dfrac{4}{s(s+1)}$. Determine natural frequency, damped natural frequency, rise time, peak time, peak overshoot and settling time. **(08 Marks)**

OR

6 Sketch the root locus plot for the given system, $GH = \dfrac{K}{s(s+4)(s+2+2J)(s+2-2J)}$ and determine the range of K for which the system remains stable. **(16 Marks)**

Module-4

7 a. State and explain Nyquist stability criteria. **(04 Marks)**

 b. Draw the complete Nyquist plot for the system whose open loop transfer function is given by, $GH = \dfrac{K}{s(1+0.1s)(1+0.5s)}$. Determine the range 'K' for which the system is stable. **(12 Marks)**

OR

8 The open loop transfer function of a unity feedback control system is:
$$G(s) = \frac{90(1+0.5s)}{(1+0.1s)(1+2s)(1+0.02s)}.$$
Draw Bode plot and determine phase margin and gain margin. **(16 Marks)**

Module-5

9 a. What are the types of compensation? Explain with the help of simple block diagrams. **(08 Marks)**

 b. What are the characteristics of lead compensator? Explain a simple lead compensator with simple diagram. **(08 Marks)**

OR

10 a. Define controllability. What is Kalman's test for controllability and observability? **(06 Marks)**

 b. Using Kalman's test, determine the controllability of the following system:
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -2 & 1 & 2 \\ 4 & 0 & 3 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 & 4 \\ -5 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$
(10 Marks)

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USN | | | | | | | | | | 15ME742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Tribology

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a. What are the desirable properties of Lubricating oil?   (06 Marks)
    b. Discuss the effect of temperature and pressure on viscosity.   (06 Marks)
    c. Discuss the purpose of lubrication.   (04 Marks)

OR

2   a. Discuss the types of lubricant and the applications.   (06 Marks)
    b. Write a note on selection of lubricants.   (06 Marks)
    c. Discuss the important application of tribology.   (04 Marks)

Module-2

3   a. With a neat sketch, explain the measurement of friction by pin on disc equipment. (08 Marks)
    b. Explain adhesion theory of friction by Bowden and Tabor. Also list the limitations. (08 Marks)

OR

4   a. Define Wear. Discuss the different types of wear with neat sketches.   (10 Marks)
    b. Write a note on wear of ceramic materials.   (06 Marks)

Module-3

5   a. Derive the Petroff's equation for a lightly loaded bearing. Also indicate the assumption made.   (08 Marks)
    b. A full journal bearing has the following specification, shaft diameter 45mm, bearing length 65mm, radial clearance is 0.0015, speed 2800 rpm, radial load 800N, viscosity of lubricant at effective temperature is 8.27×10^{-3} Pa.S. Considering the bearing as lightly loaded, determine i) Friction torque at the shaft   ii) Co-efficient of friction   iii) Power loss. (08 Marks)

OR

6   Derive Reynold's equation in 2D [two – dimension]. Also state the assumption made. (16 Marks)

Module-4

7   a. Derive an expression for load carrying capacity of a plane slider bearing with fixed shoe. (10 Marks)
    b. A rectangular plain slider bearing with fixed shoe and with no end leakage has the following data :
    i) Bearing length – 90mm   ii) Width of shoe – 90mm   iii) Load on bearing – 7800N.
    iv) Slider velocity – 250×10^{-2} mts/sec   v) Inclination $\alpha = -0.00035$ radians
    vi) Viscosity of oil $\eta = 40$ Cp.
    Determine   I) Minimum film thickness   II) Power loss   III) Co-efficient of friction. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

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OR

8   a. Derive an expression for load carrying capacity of hydrostatic step bearing. Also state the assumption made. **(10 Marks)**

b. A hydrostatic circular thrust bearing has the following data : Shaft diameter = 300mm , Diameter of pocket = 200mm   ;   Shaft speed = 100 rpm   ; Pressure at the pocket = 500kN/m^2 ;   Film thickness = 0.07mm   ; Viscosity of lubricant = 0.05Pas.   Determine i) Load carrying capacity ii) Oil flow rate   iii) Power loss due to friction. **(06 Marks)**

Module-5

9   a. Describe briefly the desirable properties of a bearing material. **(08 Marks)**

b. Explain briefly the commonly used bearing alloys. **(08 Marks)**

OR

10 a. What are the various modes by which surface properties can be enhanced? **(08 Marks)**

b. With a neat sketch, explain laser cladding. **(08 Marks)**

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KLS Vishwanathrao Deshpande Institute of Technology, Haliyal

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Mechatronics

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. Define mechatronics. Explain the difference between conventional approach and mechatronic approach. **(08 Marks)**
   b. List the objectives, advantages and disadvantages of mechatronics. **(08 Marks)**

OR

2 a. Explain the principle of capacitive proximity sensor. **(08 Marks)**
   b. What is "Hall Effect"? Explain with a neat simple sketch the principle of Hall effect. **(08 Marks)**

Module-2

3 a. Explain with a block diagram the organization of microprocessor. Explain in brief the function of each element in it. **(10 Marks)**
   b. What is a microcontroller? Explain the classification of microcontrollers. **(06 Marks)**

OR

4 a. Define the following terms: **(06 Marks)**
      (i) Data width   (ii) RAM (iii) ROM (iv) Read cycle   (v) Write cycle (vi) Interrupts
   b. What are buses? Explain the different types of buses. **(10 Marks)**

Module-3

5 a. Explain briefly basic structure of Ladder logic diagram. **(08 Marks)**
   b. Explain various requirements for selecting a Programmable Logic Controller. **(08 Marks)**

OR

6 a. Define PLC. Explain with a neat diagram working of a PLC. **(08 Marks)**
   b. Explain briefly functional requirement of robot. **(08 Marks)**

Module-4

7 a. Explain the mechanical actuation system with examples. **(03 Marks)**
   b. What is the principle of a solenoid? What are the two basic types of Solenoid? Explain the working of any one of them. **(10 Marks)**
   c. What are the types of motion any rigid body? **(03 Marks)**

OR

8 a. Explain with circuit diagram and characteristics of curves, shunt wound d.c. motor. **(06 Marks)**
   b. Explain with a neat diagram the working of a permanent magnet stepper motor to achieve step rotation. **(10 Marks)**

Module-5

9 a. With neat sketch, explain the construction of the hydraulic system. **(10 Marks)**
   b. Explain with a neat diagram the working of a
      (i) single acting cylinder   (ii) double acting cylinder. **(06 Marks)**

OR

10 a. Explain with neat diagram the construction and working of an external gear motor. **(08 Marks)**
   b. With neat sketch, explain pressure relief valve. **(08 Marks)**

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USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Eighth Semester B.E. Degree Examination, Jan./Feb. 202
Renewable Energy Sources

Time: 3 hrs.   Max.]

Note: *Answer any FIVE full questions, selecting at least TWO questions from*

PART – A

1   a.   What are primary and Secondary energy sources?
    b.   Explain the significance of Energy Consumption as a measure of prosperity.
    c.   What are the Conventional and non-Conventional Energy Sources? Describe br
         the advantages of Renewable energy.

2   a.   Define the following terms:
         i)Solar Azimuth angle   ii) Surface Azimuth angle   iii) Solar Altitude
         iv) Zenith angle (θ_z)   v) Declination angle
    b.   Determine the Local Solar time and declination at a location latitude $23^015'$]
         $77^030'$E at 12-30 IST on June 19. Equation of time Correction is given fi
         chart= -(1'01'').
    c.   What is the difference between a Pyrheliometer and a Pyronometer. Describe
         of Angstrom type Pyrheliometer.

3   a.   What are the main Components of a blot-plate Solar Collector. Explain wit
         working principle and function of each components.
    b.   With a neat Sketch Explain the following:
         i)Solar Cooker   ii) Solar Green Houses

4   a.   Explain with a neat diagram Solar Pond electric power plant with cooling tower
    b.   Write Short Notes on:
         i)Solar water pumping system
         ii)Methods of energy storage (Block diagram representation)

PART – B

5   a.   Prove that in case of horizontal axis wind turbine maximum power can be ob
         Exit Velocity=$\frac{1}{3}$ Wind Velocity and $P_{max} = \frac{8}{27g.c}\rho AV_i^3$
    b.   Describe with a neat sketch the working of a Wind Energy Conversion System (
         main Components.

6   a.   What is Pyrolysis? Explain with a neat figure Small Scale Pyrolysis Unit.

c. The observed difference between the high and low water tide is 8.5m, for a p site. The basin area is about 0.5sq km which can generate power for 3 hours i The average available head is assumed to be 8m, and the overall efficiency of tl to be 70%. Calculate the power in h.p at any instant and the yearly output. Ave Weight of sea water is assumed to be 1025kg/mt^3.

8   a. Explain with the help of Block diagram the main components of Fuel Cell Syste

    b. What are the advantages and limitations of Small Scale Hydro electric powe:

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