G 5618 (Pages : 2) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2017

**Seventh Semester**

Branch : Mechanical Engineering / Automobile Engineering

ME 010 705 / AU 010 705 – INDUSTRIAL ENGINEERING (ME, AU)

(New Scheme – 2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

## Part A

*Answer* **all** *questions.*

*Each question carries* 3 *marks.*

1. Explain Productivity.
2. What do you understand by product life-cycle?
3. Distinguish between product and process layout.
4. Explain about vendor managed inventory.
5. Explain micro motion study.

(5 × 3 = 15 marks)

## Part B

*Answer* **all** *questions.*

*Each question carries* 5 *marks.*

6. What are the functions of an industrial engineer?
7. Explain about value analysis.
8. Explain the difference between cellular manufacturing system and agile manufacturing.
9. What are the objectives of work study?
10. Explain the term TQM.

(5 × 5 = 25 marks)

**Turn over**

## Part C

*Answer* **all** *questions.*

*Each question carries* 12 *marks.*

11. Briefly explain the evolution of industrial engineering.

*Or*

12. Explain the factors affecting the productivity and briefly explain the techniques for improving productivity.

13. What are the applications and benefits of value engineering?

*Or*

14. Explain the objective and principle of plant layout.

15. Briefly explains the procedure of purchasing and discuss about various vendor rating system.

*Or*

16. Explain EOQ. Derive EOQ models with inventory shortage.

17. Explain : (a) Micro motion study ; (b) Time study.

*Or*

18. What are the Objectives of human engineering?

19. Distinguish between various control charts used in statistical quality control.

*Or*

20. Explain : (a) Benchmarking ; (b) Acceptance sampling.

(5 × 12 = 60 marks)

G 5671 (Pages : 2) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2017

**Seventh Semester**

Branch : Mechanical Engineering

ME 010 706 L04—SALES AND MARKETING MANAGEMENT (Elective II) [ME]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

## Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. What is the basis for segmenting the market ?
2. Define strategic business unit.
3. How to product life cycle affect the marketing strategies ?
4. How are the concepts of personality relevant in understanding consumer behaviour ?
5. Bring out the differences between selling and marketing.

(5 × 3 = 15 marks)

## Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. What is marketing research ? Give the scope and list the benefits of the research.
7. Explain the steps in strategic planning.
8. Sketch the typical product life cycle and describe the various stages of the life-cycle.
9. How does cultural factors influence buying behaviour ? Explain.
10. How personal communication channels are utilized in selling effectively ?

(5 × 5 = 25 marks)

## Part C

*Answer* **all** *questions.*
*Each full question carries* 12 *marks.*

11. What is the procedure for identifying market segments ? Explain the five patterns of target market selection.

*Or*

12. "Marketing mix is a mix of mixes." In the light of this statement explain the components of marketing mix.

13. What are the two levels at which marketing plan operates ? Explain the Boston consulting groups approach to assigning resources to strategic business units.

*Or*

14. Give a case study example of SWOT analysis done in marketing field.

15. Explain how a dot.com company does marketing today.

*Or*

16. Explain the general steps followed in developing a new product. Describe the testing procedure.

17. Discuss the various factors determining the buyer behaviour and the organizational buying behaviour characteristics.

*Or*

18. Discuss the consumer product acquisition process.

19. Discuss the various marketing functions and the elements of selling.

*Or*

20. Explain the procedure for recruitment, selection, training and evaluation of sales personnel.

(5 × 12 = 60 marks)

19. Write notes on :

(a) Air columns. (4 marks)

(b) Dopple effect and its applications. (4 marks)

(c) Acoustic impedance filters. (4 marks)

*Or*

20. Explain :

(a) Human tolerance level for noise. (6 marks)

(b) Noise control through barriers and enclosures and absorbent linings. (6 marks)

[5 × 12 = 60 marks]

G 5584 (Pages : 4) Reg. No.....

Name.....

## B.TECH. DEGREE EXAMINATION, MAY 2017

**Seventh Semester**

Branch : Mechanical Engineering

ME 010 702—DYNAMICS OF MACHINES (ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

### Part A

*Answer* **all** *questions.*
*Each question carries 3 marks.*

1. Why balancing is necessary for any machine ?
2. Write down the steps in energy method to find out the natural frequency of a system ?
3. What is mean by principal mode of vibration ?
4. Briefly explain graphical method to solve transient vibration problems ?
5. How sound is propagated through a medium ?

(5 × 3 = 15 marks)

### Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. Write down the steps involved for balancing several masses in different planes ?
7. Write notes on over damped, critically damped and under damped system ?
8. Explain working of a centrifugal pendulum absorber ?
9. A non-linear spring for a single degree of freedom system is given by :

   $K(x) = 100x + 1000x^3$

   C for viscous damping is 3 kg sec/cm. A harmonic force of 16 kg amplitude acts on the mass. Find the steady state response.
10. Write the working principle of a microphone and loud speaker.

(5 × 5 = 25 marks)

**Turn over**

## Part C

*Answer* **all** *questions.*

*Each question carries* 12 *marks.*

11. Three masses of 10 kg, 14 kg and 17 kg attached at radial distances of 80 mm, 100 mm and 90 mm respectively to a disk on a shaft are in complete balance. Determine the angular positions of the masses of 14 kg and 17 kg relative to 10 kg mass.

*Or*

12. The axes of a three-cylinder air compressor are at 120° to one another and their connecting rods are coupled to a single crank. The length of each connecting rod is 250 mm and stroke is 180 mm. The reciprocating parts have a mass of 3.0 kg per cylinder. Determine the primary and Secondary forces if the engine runs at 2500 rpm.

13. A gun barrel having mass 600 kg is designed with the following data :

    Initial recoil velocity 40 m/s recoil distance on firing 2.0 m calcualte.

    (a) Spring constant.

    (b) Damping coefficient and

    (c) Time required for the barrel to return to a position of 0.12 m from its initial position.

*Or*

14. Consider the spring mass system as shown in figure. The mass is given a velocity of 0.1 m/s. Wh will be the subsequent displacement and velocity of mass if :

    C = 100 N Sec/m.

    k = 3000 N/m.

    m = 20 kg.

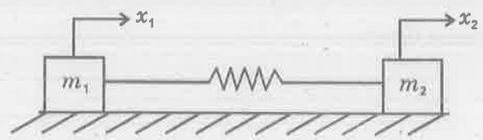
    F sin wt = 0.

    Assume the initial velocity of mass as zero. Calculate the steady state response of the mass if F sin wt = 6 sin 10 t.



15. Solve the problem shown in figure.

    $m_1$ = 15 kg $m_2$ = 20 kg and $k$ = 350 N/m



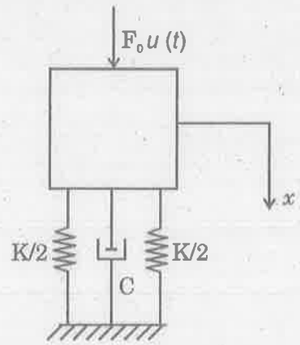

*Or*

16. Calculate the natural frequency of a shaft of diameter 12 cm and length 350 cm carrying two discs of diameters 130 cm and 225 cm respectively at its ends and weighing 500 kg and 950 kg respectively Modulus of rigidity of the shaft is $2 \times 10^6$ kgf/cm$^2$.

17. A shaft of 3.0 cm diameter, freely supported by bearing's 75 cm apart, carries a single concentrated load of 25 kg midway between the bearings. Determine first critical speed. Assume that shaft material has a density of 9 gm/cm$^3$ and E is $2.6 \times 10^6$ kg/cm$^2$.

*Or*

18. A spring mass system as shown in figure. If the system is initially relaxed and a step function excitation is applied to the mass, find the response of the system.



G 5561 (Pages : 3) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2017

## Seventh Semester

Branch : Mechanical Engineering/Automobile Engineering

ME 010 701/AU 010 701—DESIGN OF MACHINE ELEMENTS (ME/AU)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

*(Use of Machine design data hand book is permitted)*
*Any missing data may be suitably assumed.*
*Answer* **all** *questions.*

1. Explain :

   (a) Tolerances and Fits.

   (b) Procedure for section of materials.

   (c) Methods to reduce stress concentration and causes for stress concentration in a machine element.

*Or*

2. Make notes on :

   (a) Shock and impact roads.

   (b) Fatigue loading.

   (c) Endurance limit and factors affecting endurance limit.

   (d) Creep and thermal stresses.

3. A Knuckle joint is designed to carry axial load of 400kN. The dimensions of a knuckle joint are specified as follows :

   Applied load – 175 kN

   Thickness of fork – 40 mm

   Thickness of single eye – 75 mm

   Diameter of pin – 60 mm

   Outer diameter of eye – 120 mm

   Rod diameter – 50 mm

   The allowable stresses in tension, shear and crushing of joint and rod material are 75 Mpa, 60 Mpa and 150 Mpa respectively ?

*Or*

Turn over

4. A power screw houring double start square thread of 32 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 12 kN. The inner and outer diameter of screw collar surfaces are 20 mm and 50 mm respectively. The coefficients of thread friction and collar friction may be assumed as 0.15 and 0.20 respectively . The screw rotates at 24 r.p.m.

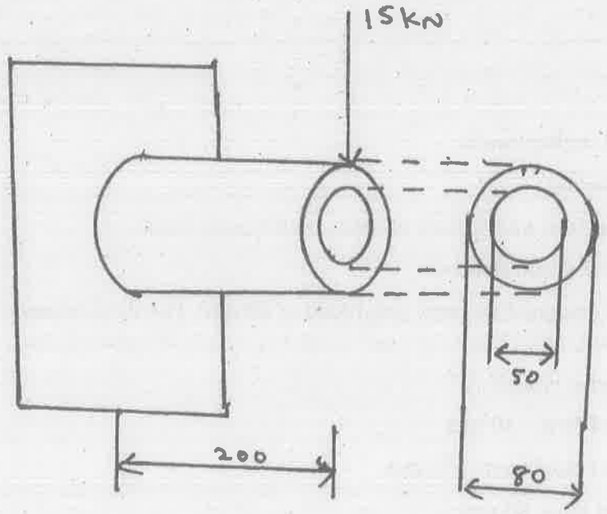
   Assume uniform wear condition. The permissible bearing pressure is 6 $N/mm^2$. The allowable shear stress in nut and screw is 30 Mpa. Determine :

   (a) The Torque required to rotate the screw.

   (b) The stress induced in the screw and

   (c) The height of nut.

5. A 200 mm long hollow circular shaft of external diameter 80 mm and internal diameter 50 mm is welded to a plate along its circumferences. The shaft carrier a concentrated load of 15 kN at free end perpendicular to the axis of the shaft of the permissible weld strength is 143 Mpa determine weld size.




*Or*



6. Design a semi-elliptical locomotive spring of 1 m length to sustain a load of 125 kN at its centre. The central band is 85 mm width. The spring should have 12 leaves maximum. Use a factor of safety as 3 is design. The total spring depth should not exceed 3 times of width.

7. A solid shaft is to transmit 300 kW at 120 r.p.m. if the shear stress is not to exceed 100 Mpa. Find the diameter of the shaft. What percentage savings in weight would be obtained if the shaft is replaced by a hollow shaft whose diameter equal to 0.6 of the external diameter the length, material and maximum shear stress being the same ?

*Or*

8. Design a brush pin flexible coupling to connect two shafts to transmit 20 kW at 900 r.p.m. Assume that shaft, pin and keys are made of 40 C8 steel, while flanges are of gray cast iron. Assume the factor of safety 3 and 5 based on yield strength and ultimate strength respectively. The crushing strength may be taken as 1.3 times the tensile strength and shear strength as 0.5 times the tensile strength.

(4 × 25 = 100 marks)

G 5598 (Pages : 3) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2017

**Seventh Semester**

Branch : Mechanical Engineering

ME 010 703—GAS DYNAMICS AND JET PROPULSION (ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

*Use of Gas tables are permitted.*

## Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. What is meant by Mach number ?
2. Briefly explain stagnation pressure and stagnation temperature.
3. What is meant by Fanno Flow and Fanno Curves ?
4. List the general characteristic of a normal shock wave.
5. List out the components of a gas turbine ?

(5 × 3 = 15 marks)

## Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. Explain concept of "continuum".
7. Discuss the flow through a convergent nozzle.
8. Write notes on Rayleigh curves.
9. Derive Prandtl Mayor relation for shock waves.
10. Explain the working of a Ramjet engine.

(5 × 5 = 25 marks)

**Turn over**

## Part C

*Answer* **all** *questions.*
*Each full question carries* 12 *marks.*

11. (a) Derive an expression :

$$\frac{p}{p_0} = \left[1 - \frac{r-1}{r+1}\left(\frac{v}{9^*}\right)^2\right]^{\frac{r}{r-1}}.$$

(6 marks)

(b) An aircraft is flying at an altitude of 10 km. where the ambient temperature is 240 K. Find the Mach number and state that whether the flow is subsonic or supersonic. Speed of the aircraft is 300 m/s.

(6 marks)

*Or*

12. A duct having varying cross-sectional area. At inlet section it is 0.05 m.$^2$ Air at 4 bar and 300 K enters this duct at 160 m/s. Another section downstream of it the fluid properties are 2 bar and 300 K with a flow velocity of 250 m/s. Find the internal thrust produced. Assume air to be a perfect gas.

13. Derive an expression :

$$\frac{A}{A^*} = \left[\frac{r-1}{2}\right]^{\frac{1}{2}}\left[\frac{e}{r+1}\right]^{r+1/2(r-1)}\left(\frac{p}{p_0}\right)^{\frac{-1}{r}}\left[1-\left(\frac{p}{p_0}\right)^{\frac{r-1}{r}}\right]^{-\frac{1}{2}}.$$

*Or*

14. Find the mass flow rate, area and fluid properties at the exit of a nozzle. The air enters the nozzle which has a throttle area 950 cm$^2$ and attains a Mach number of 2.5 at the exit. The supply air is at a pressure of 1.5 bar and temperature 22° C. Neglect the velocity of supply air.

15. A circular duct passes 10 kg./S of air at an exit Mach number of 0.5. The Mach number at the entry is 0.14. The entry pressure and temperature are 3.5 bar and 40° C. The coefficient of friction is 0.009 determine :
    (a) The diameter of the duct.
    (b) Length of the duct.
    (c) Pressure and temperature at the exit.
    (d) Stagnation pressure loss.

*Or*

16. Determine the Mach number, pressure, temperature and velocity at the exit if the increase is stagnation enthalpy of the gas between entry and exit is 1200.5 kJ/kg. The inlet pressure, temperature and velocity to the combustion chamber is 0.44 bar, 40° C and 75 m/s respectively.



17. Derive Prandtl-Mayer relation.

*Or*

18. Calculate the Mach number, pressure, temperature and velocity of gas at downstream of a shock. The state of gas is at upstream of normal shock is given by $M_x = 3$ $p_x = 2.5$ bar $T_x = 290$ K. Take $r = 1.3$ and R = 0.469 kJ/kg.K.

19. Explain the working of :
    (a) Ramjet engine.
    (b) Pulse jet engine.
    (c) Scramjet engine.

*Or*

20. Use the following data find out the maximum velocity of a rocket and the altitude attained :
    Mass ratio = 0.2
    Burn out time = 90S
    Effective jet velocity = 3000 m/s
    Also determine the velocity and altitude loss due to gravity ? Ignore drag and assume vertical trajectory.

(5 × 12 = 60 marks)

19. The moist air is at a temperature of 20°C under a total pressure of 740 mm. Hg. The dew point temperature is 15°C find :

    (a) Partial pressure of water vapour.

    (b) Relative humidity.

    (c) Specific humidity.

    (d) Specific enthalpy of water vapour.

    (e) Enthalpy of air.

    (f) Specific Volume of air.

*Or*

20. Explain working of an :

    (a) Year round air conditioning system.

    (b) Winter air conditioning.

    (c) Summer air conditioning.

(5 × 12 = 60 marks)

**G 5605** (Pages : 4) Reg. No.....

Name.....

## B.TECH. DEGREE EXAMINATION, MAY 2017

**Seventh Semester**

Branch : Automobile Engineering/Mechanical Engineering

AU 010 704/ME 010 704—REFRIGERATION AND AIR-CONDITIONING (AU, ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

*Use of RAC tables and steam tables are permitted.*

### Part A

*Answer* **all** *questions.*

*Each question carries* 3 *marks.*

1. Define "COP" in thermodynamics which law is related to refrigeration and state that law ?
2. What are the operating parameters which affect the COP of a refrigeration system and how they affect the system ?
3. What are the desirable Thermodynamic Requirements of a refrigerant ?
4. How intercooling affect the work done by a multistage compressor ?
5. What you understand by human comfort and comfort chart ?

(5 × 3 = 15 marks)

### Part B

*Answer* **all** *questions.*

*Each question carries* 5 *marks.*

6. The carrot refrigerator requires 1.2 kW per ton of refrigeration to maintain a region at a low temperature of – 35°C. Determine.

    (a) COP Carnot refrigerator ;

    (b) Higher temperature of the cycle ; and

    (c) Heat rejected in kJ/ton.

    And also calculate the heat delivered and C.O.P. when this device is used as heat pump.

7. Briefly explain simple vapour compression refrigeration system ? Draw T-S and P-H diagram. Find its COP also ?

8. Briefly explain :
   (a) House Hold refrigerator.
   (b) Cold Storage.
9. Explain the working of a screw compressor ?
10. Explain the steps involved in cooling load calculations.

(5 × 5 = 25 marks)

## Part C

*Answer* **all** *questions.*
*Each question carries* 12 *marks.*

11. (a) Briefly explain Reversed Carnot cycle used for refrigeration ? List out its diadvantages also ?

(b) The following data given for an air conditioner working on reversed Carnot cycle.

| | |
|---|---|
| Capacity | — 2 ton or 2TR. |
| Temperature of cooling coil where heat is absorbed | — 4C°. |
| Condenser heat exchanger temperature | — 60°C |
| Temperature of air entering heat rejection heat exchanger | — 45°C |
| Temperature of air leaving heat rejection heat exchanger | — 55°C |

Overall heat transfer 10-efficient of heat rejection of heat exchanger between air and working substance in the cycle — 900 kJ/hr. $m^2k$.

(i) Determine the mass flow rate of entering air.

(ii) COP and work input to the air conditioner.

*Or*

12. A bell-Coleman refrigerator operates between pressure limit of 1 bar and 8 bar. Air is drawn from cold chamber at 9°C, compressed and then it is coded to 29°C before entering the expansion cylinder. Expansion and compression follows the law $pV^{1.35} = C$. Calculate the theoretical power of the plant.



13. An Ammonia in plant operates between condenser temperature of 35°C and an evaporator temperature of – 15°C. It produced 10 ton of ice per day from water at 30°C to ice at –15°C. Assume simple saturation cycle determine.
   (a) Capacity of refrigeration plant.
   (b) The mass flow rate of refrigerant.
   (c) The discharge temperature.
   (d) The compressor cylinder diameter and stroke if its volumetric efficiency is 0.65, r.p.m. 1200 stroke/bore – 1.2.
   (e) The theoratical and actual COP.

*Or*

14. Compare the power needed by a compressor when the refrigerants are R12 and Ammonia from saturated vapour at 1.4 bar to a condensing pressure of 10 bar.
   (a) By single stage compression.
   (b) By *two* stage compression with inter coding by the liquid refrigerant at 4 bar.

   Assume saturated liquid leave condenser and dry saturated vapour leave to evaporator.

15. (a) Explain the different types of refrigerants and its application ? (6 marks)
   (b) Explain the working of an thermo-electric refrigeration system ? (6 marks)

*Or*

16. Explain the working of :
   (a) House hold refrigerator.
   (b) Water Coolers.
   (c) Cold storage.
   (d) Ice plants.

17 Explain with suitable figure different types of condensers used in refrigeration system ?

*Or*

18. Explain the operation principle of :
   (a) Hermetic compressor.
   (b) Semi-Hermetic compressor.
   (c) Screw compressor.

**G 5670** (Pages : 3) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2017

**Seventh Semester**

Branch : Mechanical Engineering

ME 010 706 L03—THEORY OF VIBRATION (Elective II) (ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

## Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. Explain beat Phenomenon.
2. What is meant by damping factor ?
3. Explain the term magnification factor ?
4. What are multi-degree freedom systems ?
5. Give the governing equation of motion of a longitudinal bar in vibration.

(5 × 3 = 15 marks)

## Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. Explain the term resonance ? How is it important in design of mechanical systems ?
7. Find the natural frequency of a spring mass system using Rayleigh's method.
8. Explain the working of accelerometer.
9. What is meant by co-ordinate coupling ?
10. What is the speed of torsional waves in a solid steel shaft of 20 mm diameter. Given E = 200 GPa, $\gamma = 0.3$, $\rho = 7800$ kg/m$^3$.

(5 × 5 = 25 marks)

**Turn over**

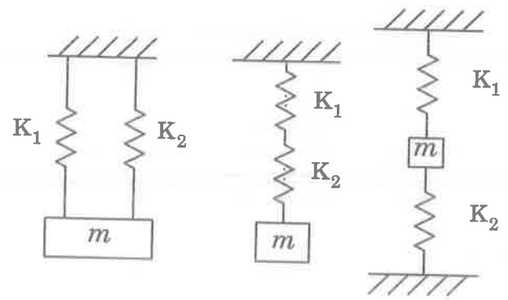
## Part C

*Answer* **all** *questions.*
*Each question carries* 12 *marks.*

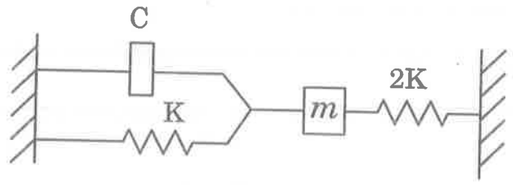
11. Determine the natural frequency of manometric fluid with density ρ, in a manometer with uniform cross-sectional area A, and length of liquid '*l*' in it.

*Or*

12. Derive the equivalent stiffness of the following spring system :




13. What is the value of C such that the system in critically damped if $m$ = 20 kg and K = 10,000 N/m ?




*Or*

14. A 100 kg block is attached to a spring of stiffness $1.5 \times 10^6$ N/m in parallel with a viscous damper of damping coefficient 4900 NS/m. The block is given an initial velocity of 5m/s. What is the maximum displacement ?

15. Write short notes on :

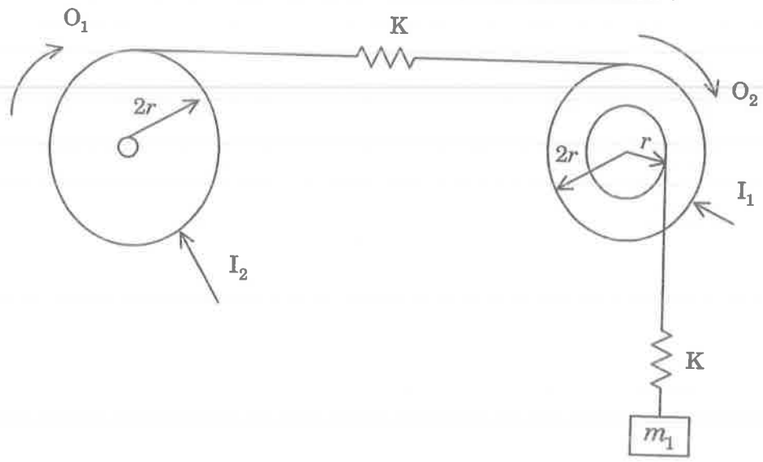
(i) Vibration isolation.
(ii) Coulomb damping.
(iii) Critical speed of shafts.
(iv) Seismometer.

*Or*

16. A 35 kg. flow monitoring device in placed on a table in a laboratory. A pad of stiffness $2 \times 10^5$ N/m and damping ratio 0.08 is placed between the support and table. The table is bolted to the floor. Measurements indicate that a steady state vibration amplitude of 0.5 mm at a frequency of 30 Hz. What is the amplitude of acceleration of the flow monitoring device ?

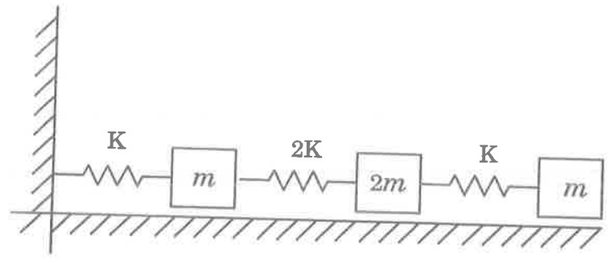


17. Find the governing equation of motion of the system shown below :




*Or*

18. Find the natural frequencies for the system below :




19. 4 bar at length L is fixed at one end and has a concentrated mass attached at the other end. Derive the frequency equation.

*Or*

20. Derive the frequency equation at a beam of length L with one end built in and the other end simply supported as shown in the figure.


(5 × 12 = 60 marks)