

B.TECH. DEGREE EXAMINATION, MAY 2018**Seventh Semester**

Branch : Automobile Engineering

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

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours

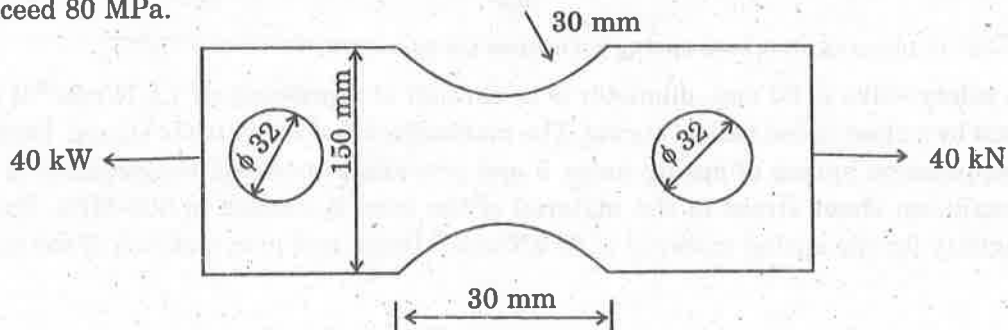
Maximum : 100 Marks

*Missing data if any, may be suitably assumed.
Use of approved design data hand book is permitted.*

Answer all questions.

Each full question carries 25 marks.

1. (a) Determine the thickness of the flat plate shown in figure below taking stress concentration into account. The plate is subjected to a tensile load of 40 kN. The stress in the plate is not to exceed 80 MPa.



(15 marks)

- (b) What are the methods to reduce stress concentration? Explain in detail. (10 marks)

Or

2. (a) A critical section in a shaft is subjected to bending and twisting simultaneously. The bending moment cause a maximum stress of 60 MPa and twisting moment a shear stress of 32 MPa. Determine the factor of safety according to all five theories of failure, if a tensile test gives a proportional limit of 290 MPa. Take Poisson's ratio as 0.30.

(20 marks)

- (b) What is meant by endurance limit. Write note on the influence of various factors of the endurance limit of a ductile material.

(5 marks)

3. Design and draw a knuckle joint to connect two mild steel bar under a tensile load of 30 kN. The allowable stresses are 65 MPa in tension, 50 MPa in shear and 85 MPa in crushing.

Or

Turn over

4. (a) What are the different types of stresses set up in bolts due to initial tightening ? Explain these stresses in detail. (10 marks)
- (b) The cutter of a broaching machine is pulled by a square thread screw of 50 mm. external diameter and 10 mm. pitch. The operating nut takes a load of 50 kN of a flat surface of 85 mm. external diameter and 55 mm. internal diameter ; coefficient of friction is 0.15 for all contact surfaces. Determine the power required to rotate the operating nut and efficiency, when the cutting speed is 15 m./min. (15 marks)
5. (a) Discuss the standard location of elements of a welding symbol. How you will represent a welding joint on a drawing with following specifications ? Single V butt joint with GMAW process, length of weld 100 mm., size 10 mm. welding is to be done at the site. (10 marks)
- (b) A plate 100 mm. wide and 10 mm. thick is to be welded with another plate by means of transverse weld at the ends. If the plates are subjected to a load of 70 kN, find the size of the weld for static as well as fatigue load. The permissible tensile stress should not exceed 70 MPa. (15 marks)

Or

6. (a) What is nipping in a leaf spring ? Discuss its role. (5 marks)
- (b) A safety valve of 60 mm. diameter is to blow off at a pressure of 1.5 N/mm^2 it is held on its seat by a close coiled helical spring. The maximum lift of the valve is 10 mm. Design a suitable compression spring of spring index 5 and providing an initial compression of 35 mm. The maximum shear stress in the material of the wire is limited to 500 MPa. The modulus of rigidity for the spring material is 80 kN/mm^2 Design and give a sketch of the spring. (20 marks)
7. A C-30 steel shaft transmits 5 hp at 150 r.p.m. The shaft is supported on two bearings 50 cm. apart. A spur gear of 120 teeth and 6 mm. module is receiving power horizontally as is mounted at a distance of 10 cm. to the left of left hand bearing. Similarly a pinion of 24 teeth and 6 mm. module is mounted 10 cm. to the right of right hand bearings. It transmits the power at an angle of 60° to the horizontal. Determine the diameter of shaft under following conditions :
- (a) Assuming the load to be static.
- (b) Considering the loading as fatigue load.

Take efficiency of gears = 90 %.

Or

8. (a) What is key ? How are the keys classified ? Explain in detail. (10 marks)
- (b) Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 r.p.m. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameter. The allowable shear stress in the coupling bolt is 30 MPa. (15 marks)

[4 × 25 = 100 marks]

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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 it is not possible to completely balance the primary accelerating force due to reciprocating mass ?
2. Discuss the energy method for deriving the equation of motion for a vibratory system.
3. Write short notes on Dunkerley's method.
4. What do you mean by self excited vibrations ?
5. What do you mean by Doppler effect ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Explain the method of direct and reverse cranks to determine the unbalance forces in radial engines.
7. Discuss briefly about vibration measuring instruments.
8. Discuss the principle of working of centrifugal pendulum absorber.
9. Distinguish between hard spring and soft spring characteristics.
10. Discuss briefly about noise induced hearing loss.

(5 × 5 = 25 marks)

Part C

Answer all questions.

Each full question carries 12 marks.

11. What are the effects of partial balancing in locomotives ? Derive the Mathematical expression for all these effects.

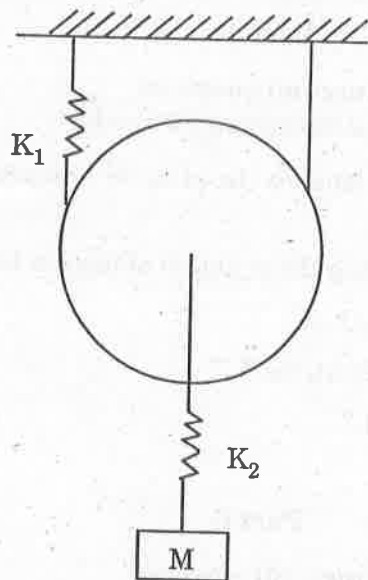
Or

Turn over

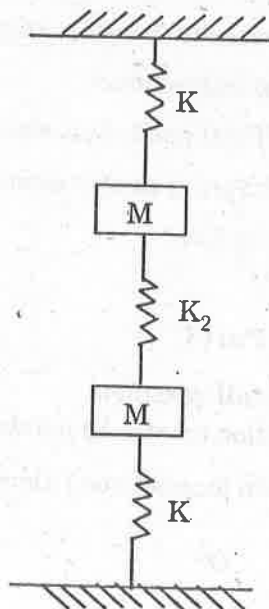
12. The successive cranks of a five cylinder in line engine are 144° apart. the spacing between cylinder centre lines is 400 mm. The lengths of the crank and the connecting rod are 100 mm. and 450 mm. respectively and the reciprocating mass for each cylinder is 20 kg. The engine speed is 630 rpm. Determine the maximum values of the primary and secondary forces and couples and the position of the central crank at which these occur.
13. Write the equations of motion for a spring mass system undergoing forced vibration with viscous damping. Derive the complete solution for the equation and also analyze the total response of the system using displacement time plot.

Or

14. Determine the natural frequency of the mass, $m = 15$ kg. as shown in figure below, assuming that the cords do not stretch and slide over the pulley rim. Assume that the pulley has no mass.



15. For the system shown in figure below, find the two natural frequencies when $M = 9.8$ kg. $K = 8820$ N/m $K_2 = 3430$ N/m.



Also find out the resultant motions of M_1 and M_2 for the following different cases. The displacements mentioned below are from the equilibrium positions of the respective mass :

- Both masses are displaced 5 mm. in the downward direction and released simultaneously.
- Both masses are displaced 5 mm., M_1 in the downward direction and M_2 in the upward direction and released simultaneously.

Or

- Two rotors A and B are attached to the end of a shaft 50 cm. long. Weight of the rotor A is 300 N and its radius of gyration is 30 cm. and the corresponding values of B are 500 N and 45 cm. respectively. The shaft is 7 cm. in diameter for the first 25 cm., 12 cm. diameter for the next 10 cm. and 10 cm. diameter for the remaining length. Modulus of rigidity for the shaft material is 8×10^{11} N/m.² Find (i) the position of the node and (ii) the frequency of torsional vibration.
- The following data relate to a shaft held in long bearings :

Length of shaft = 1.2 m.

Diameter of shaft = 14 mm.

Mass of a rotor at midpoint = 16 kg.

Eccentricity of centre of mass of rotor from centre of rotor = 0.4 mm.

Modulus of elasticity of shaft material = 200 GN/m.²

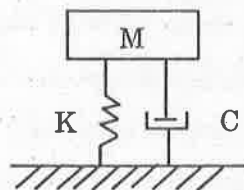
Permissible stress in shaft material = 70×10^6 N/m.²

Determine the critical speed of the shaft and the range of speed over which it is unsafe to run the shaft. Assume the shaft to be massless.

Or

- Determine the equation of motion of the mass for free vibrations as shown in figure.

Given $M = 10$ kg., $K = 1000$ N/m, $C = 100$ N.sec/m. $x(0) = 0.01$ M, $\dot{x}(0) = 0.10$ m./sec.



- Discuss the methods and equipments for recording and reproduction of sound.

Or

- Explain the importance of practical noise control. Discuss the strategies, measurements and techniques of industrial noise control. List all the challenges involved.

(5 × 12 = 60 marks)

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Seventh Semester

Branch : Mechanical Engineering/Automobile 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 do you mean by control volume approach ?
2. Define crocco number.
3. Show Fanno curves for different mass flow densities.
4. Give some desirable and undesirable behaviour of shock.
5. What are the components of a gas turbine engine ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. An aeroplane is flying at an altitude of 16 km. at a Mach number of 2.2. Determine the speed of aeroplane.
7. Isentropic flow of air takes place through a variable area duct. At one section, Mach number is 1.5 and further downstream Mach number has increased to 2.8. Find area ratio.
8. Explain choking due to friction.
9. Explain why rarefaction shocks are impossible.
10. What are the advantages of liquid propellants over solid propellants ?

(5 × 5 = 25 marks)

Turn over

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

11. (a) Explain the propagation of sound waves in gases. (6 marks)
 (b) Show that the sonic velocity in an ideal gas depends on the temperature and the nature of the gas. (6 marks)

Or

12. Using the control volume approach, derive the continuity equation and momentum equation for a one-dimensional steady flow.
13. (a) Express area ratio as a function of Mach number. (8 marks)
 (b) Using the above relation, show that a subsonic nozzle will have a convergent path and a supersonic nozzle will have a divergent path. (4 marks)

Or

14. A convergent-divergent nozzle has a throat area of 500 mm^2 and an exit area of 1000 mm^2 . Air enters the nozzle with a stagnation temperature of 360 K and a stagnation pressure of 1 MPa . Determine the maximum flow rate of air that the nozzle can pass, the static pressure, static temperature, Mach number and velocity at the exit from the nozzle if (i) the divergent section acts as a nozzle and (ii) the divergent section acts as a diffuser.
15. Air enters a circular duct of 15 cm diameter with Mach number 0.5 , pressure 300 kN/m^2 and temperature 320 K . Average friction factor for duct is 0.005 . Assuming choked adiabatic flow with friction, determine :
- (i) Length of the duct. (ii) Change in entropy.
 (iii) Change in impulse function. (iv) Loss in stagnation pressure.

Or

16. Air at $P_1 = 3 \text{ bar}$, $T_1 = 288 \text{ K}$ and $M_1 = 1.5$ is brought to sonic velocity in a frictionless constant area duct through which heat transfer can occur.
- (i) Determine the final pressure and temperature, and heat added during the process.
 (ii) What will be the Mach number, pressure and temperature of air if this heat is extracted from air?
17. (a) Explain the determination of Mach number of supersonic flow. (6 marks)
 (b) A pitot tube travelling in a supersonic wind tunnel gives values of 16 kPa and 70 kPa for the static pressure upstream of the shock and the pressure at the mouth of the tube respectively. Estimate the Mach number of the tunnel. If the stagnation temperature is 300°C ., calculate the static temperature and the stagnation pressure upstream and downstream of the tube. (6 marks)

Or

18. Express static temperature ratio and static pressure ratio across the normal shock as a function of upstream Mach number.
19. With the help of a neat sketch, explain the construction and working of a ramjet engine and derive an expression for the ideal efficiency.

Or

20. An aircraft flies at 90 km./hr. One of its turbojet engines takes in 40 kg/s of air and expands the gases to the ambient pressure. The air-fuel ratio is 50 and the lower calorific value of the fuel is 43 MJ/kg. For maximum thrust power, determine :

- (i) Jet velocity.
- (ii) Thrust.
- (iii) Specific thrust.
- (iv) Thrust power.
- (v) Propulsive, thermal and overall efficiencies.

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, MAY 2018**Seventh Semester**

Branch : Mechanical Engineering/Automobile Engineering

ME 010 704/AU 010 704—REFRIGERATION AND AIRCONDITIONING (AU/ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

*Use of refrigeration data book is allowed.**Psychrometric chart is permitted.**Assume missing data with proper justification***Part A***Answer all questions.**Each question carries 3 marks.*

1. What is a heat pump ? Define unit of refrigeration.
2. Write the difference between wet, dry and superheated compression.
3. How magnetic refrigeration works ? List out its applications.
4. Write down working principle of a capillary tube.
5. What you understand by the following term :
 - (a) Relative humidity.
 - (b) Dew point temperature.
 - (c) Wet bulb and dry bulb temperature.

(5 × 3 = 15 marks)

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

6. Determine COP, heat rejected from the system and power required for a refrigeration system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 50° C. and lower temperature is – 10° C. The capacity is to be 10TR. Neglect all the losses.
7. Briefly explain the function of Flask chamber in a vapour compression refrigeration system.
8. Write the working principle of a thermoelectric refrigeration.

Turn over

9. What is the meaning of the term optimum pressure ratio ?
10. Define by pass factor, sensible heating and cooling process, cooling and humidification.

(5 × 5 = 25 marks)

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

11. (a) A reversed Carnot cycle working as heat pump is delivering 5000 kJ/min. to heat the conditioned space and maintaining it at 27°C. when the outside temperature is 15° C. Determine Heat drawn into the conditioned space from atmospheric air and power required to drive the pump. (7 marks)
- (b) Derive an expression for COP of a Bell-Coleman cycle. (5 marks)

Or

12. Determine the theoretical COP of the plant working in a Bell-Coleman cycle. Where air is drawn from the cold chamber at 1 bar and 5° C. Then it is compressed to 5 bar in a compressor. It is then cooled to 25° C. in the cooler before expanding in the expansion cylinder to cold chamber pressure of 1 bar. Also determine the theoretical net refrigeration effect/kg. of air.

The compression and expansion be assumed isentropic, assume $r = 1.4$. $C_p = 1.009$ kJ/kg. K.When the value of $r = 1.35$ how the result is modified ?

13. A VCR system communicates thermally with a cold region at 18° C. and a warm region at 40° C. saturated vapour enters the compressor at 18° C. and saturated liquid leaves the condenser at 40° C. The mass flow rate of the refrigerant is 0.008 kg/s. Determine :
- (a) The compressor power.
- (b) The refrigeration capacity.
- (c) COP.
- (d) COP of Carnot cycle operating between 18° C. and 40° C.

Refrigerant used was R12.

Or

14. Determine the power needed to compress 11 kg./min of NH_3 from saturated vapour at 1.5 bar to a condensing pressure of 10 bar :
- (a) By single stage compression.
- (b) By two stage compression with inter cooling by the liquid refrigerant at 4 bar.

Assume saturated liquid leave the condenser and dry saturated vapour enters the compressor.

15. Explain the working of a Lithium bromide water absorption refrigeration system with neat sketch.

Or

16. Explain the working of a steam jet refrigeration system.

17. (a) With the help of a neat figure, explain the working of an evaporative condenser. (6 marks)
(b) Explain the function of a capillary tube in a VCR system. (6 marks)

Or

18. (a) What you understand by the term "Surging" ? (5 marks)
(b) Explain the working of a Vane compressor. (7 marks)

19. Atmospheric air at 76 cm. of Hg barometric pressure has 25° C. DBT and 15° C. WBT determine

- (a) The relative humidity. (b) The humidity ratio.
(c) The dew point temperature. (d) The enthalpy of air per kg. of dry air.
(e) The partial pressure of vapour. (f) The densities.

Or

20. Explain the working of a winter air conditioning system and summer air conditioning system.

[5 × 12 = 60 marks]

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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. What is mean by productivity index ?
2. What are the factors influencing plant layout ?
3. Write down the objectives of purchasing.
4. Write notes on Time study.
5. Discuss the various kinds of inspection.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Discuss the techniques used for productivity improvement.
7. Explain cellular manufacturing and just in time systems.
8. Write notes on ABC analysis.
9. What you understand by "Ergonomics" ?
10. Discuss about TQM.

(5 × 5 = 25 marks)

Part C

Answer all questions.

Each full question carries 12 marks.

11. Explain :

- (a) Functions of an industrial engineer. (6 marks)
- (b) Types of productions and factors affecting productivity. (6 marks)

Or

Turn over

12. Explain :

- (a) Product development process. (4 marks)
- (b) Value engineering and types of values. (4 marks)
- (c) Application and benefits of value engineering. (4 marks)

13. Explain :

- (a) Types of plant layouts. (6 marks)
- (b) Objectives and principles of plant layout. (6 marks)

Or

14. Explain :

- (a) Principle and selection of material handling equipment. (6 marks)
- (b) Types of material handling equipment. (6 marks)

15. Explain :

- (a) Objectives and functions of material management. (6 marks)
- (b) Purchasing procedure and buying techniques. (6 marks)

Or

16. Explain :

- (a) Objectives of inventory control and inventory cost. (4 marks)
- (b) EOQ model. (4 marks)
- (c) Vendor-managed inventory. (4 marks)

17. Explain :

- (a) Procedure for motion study. (4 marks)
- (b) Work measurement technique. (4 marks)
- (c) Time study. (4 marks)

Or

18. Explain :

- (a) The role of human engineering and its objectives and work place design. (6 marks)
- (b) Methods of job evaluation and merit rating. (6 marks)

19. Explain :

- (a) Objectives and various kinds of inspection. (4 marks)
- (b) Methods of inspection. (4 marks)
- (c) Statistical methods to control the quality. (4 marks)

Or

20. Explain :

- (a) Control charts. (6 marks)
- (b) ISO systems and QFD. (6 marks)

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, MAY 2018**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. Define amplitude, frequency and time period of periodic response.
2. Write note on “viscously damped system”.
3. Discuss forced vibration and its response.
4. What you understand by principal or normal modes of vibration ?
5. Differentiate continuous system and discrete system.

(5 × 3 = 15 marks)

Part B

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

6. What is heat phenomenon ?
7. What you understand by Viscous damping ?
8. What do you mean by vibrational absorbers ?
9. What is transmissibility ?
10. Derive necessary equations of free vibration of a string mentioning all assumptions.

(5 × 5 = 25 marks)

Part C

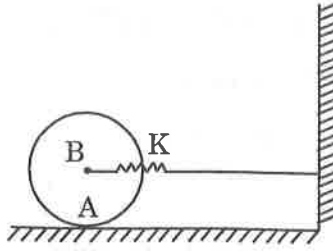
*Answer all questions.
Each full question carries 12 marks.*

11. Calculate the amplitude and the magnitude of maximum acceleration of the structure during the vibration of a system whose maximum velocity undergoing vibration is 4.57 m/s. It is further noted that this periodic motion has a frequency of 15 Hz.

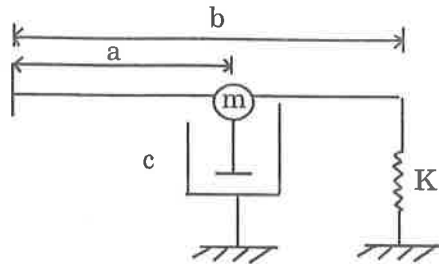
Or

Turn over

12. Find the natural frequency of the system shown in figure. Assume the disk is homogeneous mass 'm' and radius r . There is no slip during the rolling of the disk



13. Determine the natural frequency of the damped oscillation and the critical damping coefficient of a system as shown below. Take the mass of the links are negligible.



Or

14. A viscously damped vibrating system consists of a mass of 2.67 kg. and a spring of stiffness, $k = 1.8$ kN/m. If the ratio of any two successive amplitude is 1.5 and 0.95 calculate :

- Natural frequency of the damped system.
- Logarithmic decrement.
- Damping factor.
- Damping coefficient.

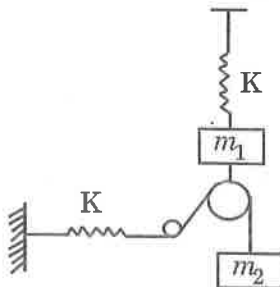
15. A shaft is simply supported on two bearings carries a rotor of 14.5 kg mass at its midspan. The bearings are 0.6 m. apart. The rotor is known to have an unbalanced weight of 0.35 kg.cm. The shaft diameter is 25 mm. and is rotated at 6000 r.p.m.. Calculate the force exerted on the bearings.

Or

16. Write detailed notes on :

- Vibration isolation and transmissibility. (6 marks)
- Vibration measuring instruments. (6 marks)

17. Derive the frequency equation of the system given below. Assume pulleys are massless.



Or

18. Explain :

(a) Working principle of a centrifugal pendulum. (6 marks)

(b) Vibration absorbers. (6 marks)

19. A uniform cantilever beam of length L and weight W_b carries a concentrated weight W_0 at the free end. Derive its frequency equation.

Or

20. Prove that the potential energy of a uniform string by tension, T undergoing vibrations is given by

$$\frac{1}{2} \int_0^h T \left(\frac{\partial y}{\partial x} \right)^2 dx$$

where h is the length of the string.

(5 × 12 = 60 marks)

G 1809

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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 do you mean by Marketing Segmentations ?
2. Narrate the marketing environment of a concern.
3. Define Marketing Mix.
4. Briefly elucidate the steps involved in market research.
5. What is SWOT analysis ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Briefly explain the marketing strategies in the different stages of a product life cycle.
7. What do you mean by "Strategic Business Unit".
8. Explain about theories of selling.
9. What is Market demand ?
10. Narrate different marketing channels.

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.

Each full question carries 12 marks.

11. Discuss organisational buying behaviour. How a consumer purchase through online.

Or

12. Define marketing management. Discuss the objectives, concepts and functions of marketing management.

13. Elucidate the new trends in marketing channels in an organisation.

Or

14. Explain the objectives of sales management.

15. Discuss the risks associated with online marketing.

Or

16. What is Relationship Marketing ? Discuss its merits and demerits.

17. Explain the components of exchange and transaction in marketing.

Or

18. What is product life cycle ? Discuss its stage.

19. Explain the process involved in new product development.

Or

20. What is traditional marketing ? How does it differ from online marketing ?

(5 × 12 = 60 marks)