Hall Ticket Number :										

R-15

Code: 5G552

III B.Tech. I Semester Regular & Supplementary Examinations November 2018

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Based on the Uniform Wear theory, derive an expression for the friction torque for a flat collar. 6M

   b) In a screw jack, the diameter of the threaded screw is 40 mm and the pitch is 8 mm. The load is 20 kN and is does not rotate with the screw but is carried on a swivel head having a bearing diameter of 70 mm. The coefficient of friction between the swivel head and the spindle is 0.08 and between the screw and nut is 0.1. Determine the total torque required to raise the load and the efficiency. 8M

OR

2. a) Sketch and explain the Cone Clutch with a neat sketch. 6M

   A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 rpm. Determine the outer and inner radii of friction surface, if the coefficient of friction is 0.25, ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2. Also determine the axial thrust to be provided by the springs. Assume the theory of uniform wear. 8M

UNIT–II

3. a) Explain the 'self-locking' and 'self-energized brake. 6M

   b) With a neat sketch, explain the 'Belt Transmission Dynamometer'. 8M

OR

4. a) Discuss the Gyroscopic effect on Ship during turning. 6M

   b) An Aircraft consists of a propeller and engine of mass moment of inertia 150 kg-m^2. The engine rotates at 3600 rpm in clockwise looking from rear. The aircraft completes half circle of radius 100 m towards left when flying at 360 kmph. Determine the gyroscopic couple on the aircraft and state its effect. 8M

UNIT–III

5. A flywheel of mass 250 kg and radius of gyration of 600 mm is attached to a shaft. The shaft rotates at a speed of 200 rpm and drives a machine. The torque of the machine varies in a cycle manner over a period of 3 revolutions. The torque rises from 250 Nm to 1000 Nm uniformly during the first half revolution and remains constant for the next one revolution. It then falls uniformly to 250 Nm during the next half revolution and remains constant for the next one revolution, the cycle being repeated thereafter. Determine:

   (i). The power required to drive the machine and

   (ii). The total fluctuation of speed of the machine shaft. 14M

OR

6. a) Define 'Sensitiveness', 'Isochronism' and 'Stability' of a Governor. 6M

   b) In a Hartnell governor, the extreme radii of rotation of the balls are 60 mm and 80 mm, and the corresponding speeds are 240 rpm and 280 rpm. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the central spring. 8M

UNIT–IV

7. a) Explain the terms 'static balancing' and 'dynamic balancing'. 4M

   b) Four masses A, B, C and D revolve at equal radii and are equally spaced along a shaft. The mass B is 7 kg and the radii of C and D make an angles of 90^0 and 240^0 respectively with the radius of B. Find the magnitude of the masses A, C and D and the angular position of A so that the system may be completely balanced. 10M

OR

8. A five cylinder in-line engine running at 750 rpm has successive cranks 144^0 apart. The distance between the cylinder centre lines is 375 mm. The length of the crank and connecting rod are 100 mm and 400 mm respectively and the reciprocating mass for each cylinder is 15 kg. Examine the engine for balance of primary and secondary forces and couples. 14M

UNIT–V

9. a) Distinguish longitudinal, transverse and torsional vibrations 6M

   b) Calculate the critical speed of a shaft 20 mm in diameter and 0.6 m long carrying a mass of 1 kg at its mid-point. Assume the shaft is simply supported and it's Young's Modulus IS 200 GN/m^2. 8M

OR

10. a) A shaft of diameter 45 mm and 1.2 m long is fixed at its one end and the other end carries a rotor of mass of 200 kg and radius of gyration 60 mm. Find the frequency of free torsional vibrations. Take G = 84 GN/m^2. 6M

    b) Describe Rayleigh's method to find the natural frequency of a shaft carrying several loads. 8M

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Hall Ticket Number :										

R-15

Code: 5G555

III B.Tech. I Semester Regular & Supplementary Examinations November 2018

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) What is thermal diffusivity? Explain its importance in heat conduction problem. 5M

   b) The thermal conductivity of a material varies linearly with temperature. Derive the one dimensional steady state heat conduction equation with internal heat generation by writing the energy balance for a differential volume element in Cartesian coordinate system. 9M

OR

2. a) Describe different types of boundary conditions applied to heat conduction problems. 5M

   b) Derive the mathematical formulation for 1-D steady state conduction through a slab of length L whose one surface is insulated and the other maintained at a temperature T_1 is exchanging heat by radiation to the ambient at a temperature T_2. 9M

UNIT–II

3. A steam pipe is covered with two layers of insulation, the first layer being 3 cm thick and the second 5 cm. The pipe is made of steel (k = 58 W/mk) having an ID 160 mm and OD of 170 mm. The inside and outside film coefficients are 30 and 5.8 W/m^2K respectively. Calculate the heat lost per meter of pipe if the steam temperature is 300^OC and the air temperature is 50^OC. The thermal conductivity of two insulating materials are 0.17 and 0.093 W/mK respectively. 14M

OR

4. A solid steel ball, initially at temperature T_0, is heated in a controlled environment in such a manner that $T_e = T_0 + 10t$ where T_e is the environmental temperature. Derive an expression for the temperature of the steel ball as a function of the convective heat transfer coefficient and time assuming negligible internal resistance. 14M

UNIT–III

5. a) Why is an analytical solution of a free convection heat transfer problem more difficult than that of a forced convection problem? 5M

   b) An instant water heater consists of a 4 mm ID tube through which water flows at the rate of 3.6 kg/hr at a temperature of 25^OC. A nichrome heating element wound over the tube provides a constant heat flux of 200 W per meter length into the water. Find the length of the tube to raise the temperature to 75^OC and also the maximum temperature at the exit. 9M

OR

6. a) Compare the variations of velocity, temperature and local heat transfer coefficient along a vertical plate which is under natural convection and forced convection. 5M

   b) Water flows through a tube of 60 mm diameter at $20^{O}C$ and leaves at $80^{O}C$. If the tube receives heat at a rate of 2000 W/m^2 at the surface, determine the surface temperature at the outlet of the tube and the length of the tube for a flow rate of 0.01 kg/s. 9M

UNIT–IV

7. a) Distinguish between filmwise and dropwise condensation. Which of these gives a higher heat transfer coefficient and why? 5M

   b) A net radiation from the surfaces of two parallel plates maintained at temperatures T_1 and T_2 is to be reduced by 79 times. Calculate the number of screens or shields to be placed in between the two surfaces to achieve this reduction in heat exchange, assuming the emissivity of screens as 0.05 and that of the surfaces as 0.8. 9M

OR

8. a) Describe in detail the process of nucleate boiling and give one form of equation frequently used. 5M

   b) Silica glass transmits 92% of incident radiation in the wavelength range between 0.35 and 2.7 micrometer and is opaque at longer and shorter wavelengths. Estimate the percentage of solar radiation that the glass will transmit. The Sun can be assumed to radiate as a black body at 5800 K. (Please provide the Black body radiation functions Chart) 9M

UNIT–V

9. Water enters a counter flow double pipe heat exchanger at $15^{O}C$, flowing at the rate of 1300 kg/hr. It is heated by oil (C_P = 2000 J/kgK)flowing at the rate of 550 kg/hr from the inlet temperature of $94^{O}C$. For an area of 1 m^2 and an overall heat transfer coefficient of 1075 W/m^2K, determine the total heat transfer and the outlet temperature of water and oil. Effectiveness = {1–exp[-N(1-C)]}/{1-C exp[-N(1-C)]}, where C is the heat capacity ratio. 14M

OR

10. a) A counter flow double tube heat exchanger is used to cool engine oil (C_P = 2130 J/kgK) from $160^{O}C$ to $60^{O}C$ with water available at $25^{O}C$ as the cooling medium. The flow rate of the cooling water through the inner tube of 0.5 m dia is 2 kg/s while the flow rate of oil through the outer annulus OD = 0.7 m is also 2 kg/s. If the value of the overall heat transfer coefficient is 250 W/m^2K, how long should be the heat exchanger? 10M

    b) Why it is considered, for most of the cases, Counter flow heat exchanger is more effective than parallel flow heat exchanger. 4M

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Hall Ticket Number :										

R-15

Code: 5GA51

III B.Tech. I Semester Regular& Supplementary Examinations November 2018

Managerial Economics and Financial Analysis

(Common to CE, ME & ECE)

Max. Marks: 70 Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT-I

1. Define Price elasticity, Income elasticity and Cross price elasticity of demand. What are the different methods of measuring Price Elasticity of demand? Derive relationship between Price Elasticity of Demand and Marginal Revenue?

OR

2. Define Managerial Economics. Discuss the nature and scope of Managerial Economics. What is the relationship of Managerial Economics with Microeconomics?

UNIT-II

3. What is the shape of long-run average cost curve and explain why? Differentiate between Economies of Scale and Economies of Scope with suitable examples.

OR

4. Define and show graphically the Break even point of a firm. Find out the break even output (Q*) of a firm if total cost (TC) = Rs. 6310; total revenue (TR) = Rs. 4130; fixed cost (FC) = Rs. 4980; variable cost (VC) = Rs. 1330 and present output (Q) = 5.

UNIT-III

5. Compare and Contrast the Short-run and Long-run equilibrium conditions under Perfect competition and Monopoly market.

OR

6. Define Oligopoly market structure. Describe how price and output is determined under Stackelberg Duopoly model.

UNIT-IV

7. Why is capital important for a firm? What are the various sources of raising capital? Elaborate.

OR

8. What is capital budgeting? Define Net Present Value and Discount Rate. Write a brief note on Pay Back Method.

UNIT-V

9. What do you understand by the term ‘Ledger’ and ‘Trial Balance’? Name two methods of preparing a Trial Balance. Prepare a purchase book from the following information:
   a) Purchase of goods costing Rs. 5000/- from M/s Ramesh & Co. vide invoice no. 120 dated 15/09/2017.
   b) Purchase of Fixed Assets costing Rs. 8000/- from M/s Renu & Co. vide invoice no. 016 dated 20/09/2017.
   c) Paid wages of Rs. 600/- in cash vide receipt no.16 dated 25/09/2017.

OR

10. What is the meaning of Accounting Ratios? What are the objectives of ratio analysis? List out the advantages and limitations of ratio analysis.

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Hall Ticket Number :										

R-15

Code: 5G553

III B.Tech. I Semester Regular & Supplementary Examinations November 2018

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Compare orthogonal and oblique cutting processes with neat sketch 7M

   b) Discuss about ASA tool nomenclature system. 7M

OR

2. a) Define tool life, tool wear. Discuss about Taylor tool life equation. 7M

   b) What are the various sources of heat generation in metal cutting? Explain the working principle of tool-work thermocouple. 7M

UNIT–II

3. a) How do you specify lathe? Explain any five operations performed on lathe. 7M

   b) A 600mm long, 50 mm diameter stainless steel bar is being reduced in diameter to 40mm in turning on lathe. The spindle rotates at 400 RPM; the tool is travelling at a speed of 8 mm/min. Calculate the (i) Cutting speed (ii) Material removal rate (iii) Cutting time. Assume no approach and over travel length and number of passes = 2. 7M

OR

4. a) Explain the thread cutting operation on lathe machine 7M

   b) Classify various types of automatic lathes and explain the working principle of a Swiss type automatic machine with a neat sketch. 7M

UNIT–III

5. a) What is quick return mechanism? Explain the working principle of Whitworth quick return mechanism with neat sketch 7M

   b) With a neat sketch explain the construction features of Jig boring machine. 7M

OR

6. a) How do you classify milling machines? Explain the constructional details of horizontal milling machine. 7M

   b) Define Indexing. Explain the following Indexing methods.
   (i) Direct or Rapid Indexing **(ii)** Simple or Plain Indexing 7M

UNIT–IV

7. a) How do you classify grinding machines? Explain the constructional feature of cylindrical grinding machine. 7M

   b) Discuss about specification and selection of a grinding wheel. 7M

OR

8. a) Define broaching operation. What are the elements of a broach tool? 7M

   b) Classify broaching machines. Discuss about construction and working of surface broaching machine. 7M

UNIT–V

9. a) Explain the working of honing process with neat sketch. 7M

   b) Outline the various design principles of Jigs and fixtures. 7M

OR

10. a) Sketch and explain any four clamping devices. 7M

    b) Sketch and explain any two types of drill jigs. 7M

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Hall Ticket Number :										

R-15

Code: 5G551

III B.Tech. I Semester Regular & Supplementary Examinations November 2018

Applied Thermodynamics-II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Draw the different processes of Rankine cycle on a P-V and T-S diagram and mention the different operations of Rankine cycle. 6M

   b) A steam power plant operates on ideal Rankine cycle. The steam enters the turbine at 3MPa, 350^0C and is condensed in the condenser at 75 kPa, calculate thermal efficiency and work ratio of this cycle. 8M

OR

2. a) Explain different methods to improve the efficiency of Rankine cycle and represent them on TS diagram. 6M

   b) In a Rankine cycle, the steam at inlet to turbine is saturated at pressure of 30 bar and exhaust pressure is 0.25 bar. Determine (i) The pump work (ii) Turbine work (iii) Rankine efficiency (iv) dryness at the end of expansion. Assume flow rate of 10 kg/s. 8M

UNIT–II

3. a) Explain with help of neat diagram Cochran boiler. 7M

   b) Explain with the help of neat diagram Lancashire boiler. 7M

OR

4. a) Derive an expression for maximum discharge rate of gases through the chimney for a given height of the chimney. 7M

   b) Calculate the height of a chimney required to produce a draught equivalent to 1.7cm of water if the flue gas temperature is 270^0C and ambient temperature is 22^0C and minimum amount of air per kg of fuel is 17kg. 7M

UNIT–III

5. a) What is the effect of friction on nozzle? Represent the same on TS diagram. 4M

   b) In a convergent-divergent nozzle, the steam enters at 15 bar and 300 ^{0}C and leaves at 2 bar. The inlet velocity to the nozzle is 150 m/s. Find the required throat and exit areas for a mass flow rate of 1 kg/s. Assume nozzle efficiency to be 90% and Cps = 2.4 kJ/kg K. 10M

OR

6. a) Explain working principle of Surface Condenser with neat sketch. 6M

   b) The air entering a steam condenser with steam is estimated at 6kg per hour. The temperature at inlet to air cooler section is 30^0C and at the outlet 26^0C. The vacuum in the shell is essentially constant throughout and is 721mm of Hg, while the barometer reads 758 mm of Hg. Calculate the volume of air entering the cooling section per hour, the mass of moisture contained in the air and the mass of steam condensed per hour in the cooling section. 8M

UNIT–IV

7. a) Sketch the velocity diagram of a single stage impulse turbine and determine the expression for the force, work done, diagram efficiency and axial thrust. 6M

   b) Steam leaves the nozzle of a single stage impulse turbine at 850 m/s. The nozzle angle is18^0 and the blade angles are 29^0 at the inlet and outlet. The friction coefficient is 0.9. Calculate blade velocity and steam mass flow rate in kg/hr to develop 300 W power. 8M

OR

8. A single stage of simple impulse turbine produce 120 kW at blade speed of 150 m/s when steam mass flow rate is 3 kg/s. Steam enters moving blade at 350 m/s and leaves the stage axially. Considering velocity coefficient of 0.9 and smooth entry without shock into blades, determine the nozzle angle and blade angles. 14M

UNIT–V

9. In a reaction turbine 6 kg/s steam is admitted at 15 bar dry saturated in the first stage. Turbine has eight pairs on mean diameter of 50 cm and run at 3000 rpm with mean blade speed to steam velocity ratio of 0.8. There occurs tip leakage of steam at all rows amounting to 10% of total and efficiency of working steam is 85%. Considering blade outlet angles for both fixed and moving blades to be 20^0, determine the following analytically.
   i. The output from turbine in hp,
   ii. The pressure of steam leaving turbine,
   iii. The mean blade height. 14M

OR

10. a) Explain the following terms as applied to steam engines :
   (i) Mean effective pressure, (ii) Back pressure, (iii) Brake power, (iv) Indicated power, and (v) Diagram factor. 7M

   b) Using neat sketches enumerate and explain the various parts of a steam engine. 7M

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Hall Ticket Number :										

R-15

Code: 5G554

III B.Tech. I Semester Regular & Supplementary Examinations November 2018

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) What is the general procedure adopted in the design of machine elements? 7M

   b) A mass of 50 kg drops through 25mm at the centre of a 250 mm long simply supported beam. The beam has a square cross-section. It is made of steel 30C8 (S_{yt} = 400 N/mm^2) and the factor of safety is 2. The modulus of elasticity is 207 000 N/mm^2. Determine the dimension of the cross section of the beam. 7M

OR

2. a) Explain briefly about the preferred numbers. 4M

   b) A Mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to i. Rankine's theory; ii. Guest's theory; and 3. The maximum distortion strain energy theory of yielding. 10M

UNIT–II

3. a) An automobile leaf spring is subjected to cyclic stress such that the average stress is 150Mpa, variable stress is 350Mpa; the material properties are; ultimate strength = 400Mpa; yield strength=350Mpa; endurance limit=270Mpa; estimate the factor of safety using Goodman method and Soderberg method? 7M

   b) Discuss the design procedure for the components subjected to completely reversed fluctuating stresses with respect to finite life. 7M

OR

4. a) Define endurance limit? Discuss the factors which affect the endurance limit of the material. 7M

   b) What is stress concentration? Give two examples with sketches how to minimize the stress concentration. 7M

UNIT–III

5. a) Explain basic types of screw fastenings. 6M

   b) A bracket for supporting the travelling crane is shown in Fig. 2. The bracket is fixed to the steel column by means of four identical bolts, two at A and two at B. The maximum load that comes on the bracket is 5 KN acting vertically downward at a distance of 250 mm from the face of the column. The bolts are made of steel 40C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 5. Determine the major diameter of the bolts on the basis of maximum principal stress.

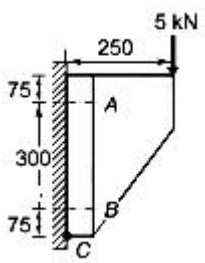

Fig. 2 8M

OR

6. a) What is the cause of residual stresses in welded joints? How are they relieved? 4M

   b) A plate, 75 mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds, as shown in Fig. 3. The joint is subjected to a maximum tensile force of 55 kN. The permissible tensile and shear stresses in the weld material are 70 and 50 N/mm^2 respectively. Determine the required length of each parallel fillet weld.

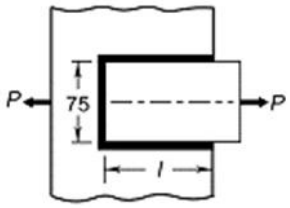

Fig.3. 6M

   c) A 50 mm diameter solid shaft is to be welded to a plate by means of a fillet weld, around the circumference of the shaft. Determine the size of the weld, if the shaft is subjected to a torque of 4 kN-m. The allowable shear stress in the weld is 45 MPa. 4M

UNIT–IV

7. a) A 10kW power is transmitted at 800 rpm, from a motor shaft, through a key, to a machine shaft by a means of a pulley and a belt. Design the key. Take the allowable shear stress and crushing stress are 45MPa and 100Mpa. 6M

   b) Sketch and explain the design procedure for a Cotter joint with Gib. 8M

OR

8. a) What are the functions of key? Classify the keys. 4M

   b) Two mild steel rods are connected by a knuckle joint to transmit an axial load of 150 KN. Design the joint completely. Assume the working stresses for both the pin and rod material as 80 MPa in tension, 68 MPa in shear and 160 MPa in crushing. 10M

UNIT–V

9. a) What is torsional rigidity of a shaft? How is a shaft designed for torsional rigidity? 4M

   b) A shaft transmits 9 kW at 1200 rpm and at the same time is subjected to a bending moment of 1.8 KN-m. Determine the diameter of a solid shaft limiting the shear stress to 60 MPa. What is the % saving in material if it is replaced by a hollow shaft of the same material with diameters ratio of 2? 10M

OR

10. a) What are the advantages of flexible couplings? 2M

    b) Design a Cast Iron flange coupling for a steel shaft transmitting 15 KW at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25 % greater than the full load torque. The shear stress for Cast Iron is 14MPa. 12M

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