Hall Ticket Number :										

R-11 / R-13

Code: 1G552

III B.Tech. I Semester Supplementary Examinations May 2018

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Derive an expression for the Gyroscopic Couple. 7M

   b) Each wheel of a motorcycle is of 600 mm diameter and has a moment of inertia of 1.2 kg m^2.The total mass of the motorcycle and the rider is 180 kg and the combined centre of mass is 580 mm above the ground wheel when the motorcycle is upright. The moment of inertia of the rotating parts of the engine is 0.2 kg m^2.The engine speed is 5 times the speed of the wheels and is in the same sense. Determine the angle of heel necessary when the motorcycle takes a turn of 35 m radius at a speed of 54 km/hr. 7M

2. a) Explain the terms: Friction circle and Friction axis. 6M

   b) A vertical screw with single start square threads 50 mm mean diameter and 12.5 mm pitch is raised against a load of 10 kN by means of a hand wheel, the boss of which is threaded to act as a nut. The axial load is taken up by a thrust collar which supports the wheel boss and has a mean diameter of 60 mm. If the coefficient of friction is 0.15 for the screw and 0.18 for the collar and the tangential force applied by each hand to the wheel is 100 N. Find suitable diameter of the hand wheel. 8M

3. a) A multi-disc clutch transmitting 25 kW of power at 1500 rpm has three discs on the driving shaft and two on the driven shaft. The outside and inside diameters of the contacting surfaces are 240 mm and 120 mm respectively. Assuming the condition of uniform wear. Determine the maximum axial intensity of pressure between the discs. Take coefficient of friction as 0.3. 8M

   b) Explain the working principle of Belt transmission dynamometer with a neat sketch. 6M

4. a) Derive a relation for the turning moment at the crankshaft in terms of piston effort and the angle turned by the crank. 5M

   b) The torque delivered by a two stroke engine is represented by $T=(1200+1400\ \sin\theta+210\ \sin\theta+21\ \sin 3\theta)$ N.m where θ is the angle turned by the crank from the inner-dead centre. The engine speed is 210 rpm. Determine the power of the engine and the mass of the flywheel if its radius of gyration is 800 mm and the maximum fluctuation of speed is to be +/- 1.5 % of the mean. 9M

5. a) Explain the terms Sensitiveness, Hunting, Effort, Power and Isochronism in connection with the Governors. 7M

   b) Calculate the speed range of a Porter governor, where each arm is 180 mm long and is pivoted on the axis of rotation. The mass of each ball is 4 kg and the Central mass on the sleeve is 18 kg. The radius of the ball is 100 mm when sleeve begins to rise and 140 mm when at top. 7M

6. A shaft carries four masses A,B,C and D of magnitude 200 kg,300 kg,400 kg and 200 kg respectively and revolving at radii 80 mm,70 mm,60 mm and 80 mm in planes measured from A at 300 mm,400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45^0,B to C 75^0,and C to D 120^0.The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. 14M

7. a) What are the effects of Partial balancing in locomotives? 7M

   b) A Vee-twin engine has cylinder axes at right angles and the connecting rods operate a common crank. The reciprocating mass per cylinder is 11.5 kg and the crank radius is 75 mm. The length of the connecting rod is 0.3 m. Show that the engine may be balanced for primary forces by means of a revolving balance mass. If the engine speed is 500 rpm. What is the value of maximum resultant secondary force? 7M

8. a) Discuss briefly about Vibration isolation and Transmissibility. 6M

   b) In a single- degree damped vibrating system, a suspended mass of 8 kg makes 30 oscillations in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine the (i) stiffness of the spring (ii) logarithmic decrement (iii) damping factor (iv) damping coefficient. 8M

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Code: 1G555

III B.Tech. I Semester Supplementary Examinations May 2018

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Derive the one-dimensional, steady state heat conduction equation with internal heat generation by writing the energy balance for a differential volume element in cylindrical coordinate system. 9M

   b) A solar panel, 1 m x 1.25 m receives solar radiation of 1500 W. Calculate surface temperature of the panel if the ambient temperature is 25^0C and the convective heat transfer coefficient of the air film over the surface of panel is 12.5W/m^2 ^{0}C 5M

2. A heating unit is made in the form of a 1.2 m long; 6 cm diameter cylinder is placed in an atmosphere of 18^0C. It is provided with 20 longitudinal straight fins 0.3 cm thick which protrude 50 mm from the cylinder surface. The temperature of the base of the fins is 80^0C. The local heat transfer coefficient from the cylinder and fins to the ambient air are 9.3 W/m^2K and the thermal conductivity of the tube wall is 55.7W/mK. Calculate the rate of heat transfer from the finned wall to the surroundings. 14M

3. a) What are Biot and Fourier's numbers? Explain their significance. 6M

   b) A 2mm thick copper plate at 400^0C is suddenly dipped into water at 20^0C.Calculate the time required for the plate to reach a temperature of 40^0C taking h=93W/m^2K. For plate ρ=8800kg/m^3,c=0.381kJ/kg K, area=30cmx30cm, and k=370W/mK. 8M

4. a) Explain the various parameters used in forced convection. Using dimension analysis obtain an expression for Nusselt number in terms of Reynolds and Prandtl numbers. 10M

   b) Define Nusselt, and Prandtl numbers. Explain their importance in convective heat transfer? 4M

5. a) For a fluid flow along flat plate, explain the velocity distribution in a hydrodynamic boundary layer? 6M

   b) A vertical plate at 100^0C is 1 m wide and 20 cm high. It rests in still air at 1 atm and 20^0C. Determine the local heat transfer coefficient at 10 cm from the leading edge of the plate. The properties of the air at film temperature may be taken as: Thermal conductivity is 0.03 W/m.K, Viscosity is 2.03× 10^{-5} PaS, Density is 1.00 kg/m^3. Specific heat 1.01 kJ/kg.K. 8M

6. a) Sketch the film wise condensation on a vertical wall showing film thickness, velocity and temperature profiles. 4M

   b) Water at atmospheric pressure is boiled in a kettle made of copper. The bottom of the kettle is flat, 30 cm in diameter and is maintained at a temperature of 118^0C. Calculate the rate of heat required to boil water. Also estimate the rate of evaporation of water from the kettle. 10M

7. a) Discuss the advantages of NTU method over the LMTD method of heat exchanger design. 4M

   b) Water at the rate of 4080kg/h is heated from 35^0C to 75^0C by oil having a specific heat of 1900J/kg K. The exchanger is of a counter flow double pipe design. The oil enters at 110^0C and leaves at 75^0C.determine the area of the heat exchanger necessary to handle this load if the overall heat transfer coefficient is 320W/m^2K 10M

8. a) Define the terms absorptivity, reflectivity and tranmissivity. 3M

   b) Two equal discs of diameter 200 mm each are arranged in two parallel planes 400 m apart. The temperature of the first disc is 500^0C and that of the second disc is 300^0C. Determine the radiating heat flux between them, if these are i. Black ii. Gray with emissivities 0.3 and 0.5 respectively. 11M

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R-11 / R-13

Code: 1G553

III B.Tech. I Semester Supplementary Examinations May 2018

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **Five** questions
All Questions carry equal marks (**14 Marks** each)

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1.	a)	Discuss important properties of cutting tool.	7M
	b)	Discuss the various types of cutting tools.	7M
2.	a)	Discuss the specifications of lathe.	7M
	b)	Differentiate between capstan and turret lathe.	7M
3.	a)	Differentiate between shaper and slotter with their applications.	7M
	b)	Describe with a line diagram of Whitworth quick return mechanisms used in slotter.	7M
4.	a)	What is the function of a tap drill?	4M
	b)	Explain with a neat sketch the construction and working principle of a radial drilling machine.	10M
5.	a)	How are milling machines classified? What is the difference between plain and universal type?	7M
	b)	Compare up-cut and down-cut milling process with particular reference to chip formation and forces induced in component and cutter.	7M
6.	a)	What are the advantages and limitations of using centreless grinding?	7M
	b)	How the grinding wheel is selected? Outline various factors that influence its selection.	7M
7.	a)	How do you classify the different types of broaching machines?	7M
	b)	What is lapping? What are its advantages?	7M
8.	a)	What are the functions of jigs and fixtures?	7M
	b)	List the types of drill jigs and discuss any one	7M

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R-11 / R-13

Code: 1G551

III B.Tech. I Semester Supplementary Examinations May 2018

Thermal Engineering–II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Explain the working of Rankine cycle and derive an expression for its efficiency with T-S diagram? 8M
   b) Discus about various procedures to improve Rankine cycle efficiency with suitable diagrams? 6M

2. a) State how the boilers are classified? 7M
   b) List various boiler mountings and Accessories? 7M

3. a) In a boiler test 1250 kg of coal is consumed in 24hours. The mass of water evaporated is 13000 kg and the mean effective pressure is 7 bar. The feed water temperature was 40^0C, heating value of coal is 30000 kJ/kg. The enthalpy of 1kg steam at 7 bar is 2570.7 kJ. Determine Equivalent evaporation per kg of coal and Efficiency of the boiler 10M
   b) What are the advantages of artificial draught over natural draught 4M

4. a) In a steam nozzle steam expands from 4 bar to 1 bar. The initial velocity of steam is 60 m/s and the initial temperature is 200^0C. Determine the exit velocity if the nozzle efficiency is 92%. 8M
   b) What do you understand by supersaturated flow? Explain with the help of h-s diagram. 6M

5. What do you mean by compounding of steam turbines? Discuss various methods of compounding steam turbines with suitable diagrams. 14M

6. A50% reaction turbine running at 400 RPM with exit angle of the blades as 20^o and velocity of steam relative to the blades at the exit is 1.35 times of the mean blade speed. The turbine is supplied with steam at 8.33 kg/s and at a particular stage the specific volume is 1.381 m^3/kg Determine a suitable blade height, assuming the rotor mean diameter 12 times the blade height and the diagram work ? 14M

7. a) Give the basic classification of steam condensers and explain the working of a vacuum condenser with neat sketch? 8M
   b) Steam enters a condenser at 36^0C and with barometer reading 760 mm of Hg. If vacuum of 695 mm of Hg. is produced find the vacuum efficiency? 6M

8. a) Define Mechanical efficiency, Thermal efficiency and Relative efficiency pertaining to Steam engines? 6M
   b) Explain about throttle governing of a steam engine with the help of a neat sketch? 8M

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