Hall Ticket Number :										

R-11 / R-13

Code: 1G552

III B.Tech. I Semester Supplementary Examinations November 2019

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. Find the angle of inclination with respect to the vertical of a two-wheeler negotiating a turn. Given: combined mass of the vehicle with rider is 250 kg. Moment of inertia of the engine flywheel 0.30 kg-m^2, Moment of inertia of each road wheel 1 kg-m^2, speed of the engine flywheel 5 times that of road wheels and in the same direction; height of centre of gravity of rider with vehicle 0.60 m, two-wheeler speed 90 km/hr, wheel radius 0.30 m and radius of turn 50 m. 14M

2. a) Derive an expression for the effort required to raise a load with a screw jack by taking friction into consideration. 7M

   b) A screw jack is used to raise a load of 50KN. The pitch of single start square threads used for the screw is 24mm. The mean diameter is 72mm. Determine the force to be applied at the end of 1.2m long handle when the load is lifted with constant velocity and rotate with the spindle. Take co-efficient of friction is 0.2. Also find the mechanical efficiency of the jack. 7M

3. a) What is the difference between absorption and transmission dynamometers? 6M

   b) Describe with a neat sketch the working of a single plate friction clutch 8M

4. a) Find a relation for the coefficient of fluctuation of speed in terms of maximum fluctuation of energy and the kinetic energy of the flywheel at mean speed? 7M

   b) A vertical double acting steam engine develops 75 kW at 250 r.p.m. The maximum fluctuation of energy is 30 per cent of the work done per stroke. The maximum and minimum speeds are not to vary more than 1 per cent on either side of the mean speed. Find the mass of the flywheel required, if the radius of gyration is 0.6 m 7M

5. a) What is governor? Classify different types of governors 6M

   b) In a porter governor, the upper and lower arms are each 250 mm long and are pivoted on the axis of rotation. The mass of each rotating ball is 3 kg and the mass of the sleeve is 20kg. The sleeve is in its lowest position when the arms are inclined at 30^0 to the governor axis. The lift of the sleeve is 36 mm. Find the force of friction at the sleeve, if the speed at the moment is falls from the highest position. Also find the range of speed of the governor 8M

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) Explain the 'direct and reverse crank' method for determining unbalanced forces in radial engines 7M

8. a) Explain the term 'Whirling Speed' of a shaft. 7M

   b) Describe in detail the method of finding the frequency of torsional vibration of a two-rotor system? 7M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G555

III B.Tech. I Semester Supplementary Examinations November 2019

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) Generate expression for temperature distribution, under 1D steady state heat conduction for cylindrical system. 7M

   b) What is the thickness required of a masonry wall having thermal conductivity 0.75 W/mK if the heat rate is to be 80% of the heat rate through a composite structural wall having a thermal conductivity of 0.25 W/mK and a thickness of 100 mm? Both walls are subjected to the same surface temperature difference. 7M

2. a) Air at 90^0C flows in a copper tube of 5cm inner diameter with thermal conductivity 380 W/mk and with 0.7cm thick wall which is heated from the outside by water at 120^0C. A scale of 0.4 cm thick is deposited on the outer surface of the tube whose thermal conductivity is 1.82 W/mk. The air and water side unit surface conductance are 220 W/m^{2}k and 3650 W/m^{2}k respectively. Calculate overall water to air transmittance, water to air heat exchange 10M

   b) Derive the expression for corrected length for rectangular and circular fins. 4M

3. a) Explain the significance of Biot number and Fourier number. 4M

   b) A slab of 15 cm thick is originally at a temperature of 500^0C. It is suddenly immersed in a liquid at 100^0C resulting in a heat transfer coefficient of 1000W/m^{2}K. Determine the temperature at the centerline and on the surface 30minutes after immersion. Also calculate the total thermal energy removed per unit area during this period. Take $\alpha = 6.1 \times 10^{-6}$ m^2/s, k = 40 W/m K. ρ=7800 kg/m^3 and C = 840 J/kg K. 10M

4. a) What is dimensional analysis? What are the uses of dimensional analysis? 5M

   b) Air 20^0C at atmosphere pressure flows over flat plate at a velocity of 3 m/s. If the plate is 1 m wide and 80^0C, calculate the following at x=300mm Hydrodynamic boundary layer thickness, thermal boundary layer thickness, local friction coefficient, average heat transfer coefficient and Heat transfer. 9M

5. a) Define boundary layer and briefly explain its characteristics? 6M

   b) A square glass plate 1.5 m^2 area and 4 mm thick ness is heated uniformly to 90^0C and it is cooled by air at 20^0C which is flowing over both sides parallel to the plates at 3 m/s. Calculate the initial rate of cooling the plate. Take for glass density 2500 kg/m^3, specific heat 0.67 kJ/kg For air density 1.076 kg/m^3, specific heat 1008 kJ/kg, thermal conductivity 0.0286 w/mk and absolute viscosity 19.8 X 10^{-6} N-S/m^2 8M

6. a) What is the difference between film and dropwise condensation? Which is a more effective mechanism of heat transfer? 6M

   b) The outer surface of a cylinder vertical drum having 25 cm diameter is exposed to saturated steam at 1.7 bar for condensation. The surface temperature of the drum is maintained at 85^0C. Calculate the following:

      i. Length of the drum

      ii. Thickness of condensate layer to condense 65 kg/h of stem. 8M

7. a) Classify heat exchangers according to flow type and explain the characteristics of each type. 5M

   b) Hot oil is to be cooled in a double-tube counter-flow heat exchanger. The copper inner tubes have a diameter of 2 cm and negligible thickness. The inner diameter of the outer tube (the shell) is 3cm. Water flows through the tube at a rate of 0.5 kg/s, and the oil through the shell at a rate of 0.8 kg/s. Taking the average temperatures of the water and the oil to be 45°C and 80°C, respectively, determine the overall heat transfer coefficient of this heat exchanger. 9M

8. a) Derive an expression for **radiation** exchange between two black bodies separated by a Non-absorbing medium 10M

   b) Assuming sun to be black body emitting radiation with maximum intensity at $\boldsymbol{\lambda}$=0.5μ, calculate its surface temperature and emissive power. 4M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G553

III B.Tech. I Semester Supplementary Examinations November 2019

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)	Explain Merchants force diagram for a metal cutting operation	7M
	b)	Discuss the various types of chips produced during metal machining	7M
2.	a)	With a neat sketch, explain how taper turning operation is performed by tail Stock set over method.	7M
	b)	Differentiate between capstan and turret lathe	7M
3.	a)	Briefly give the differences between a planner and a shaper	7M
	b)	Draw a block diagram of a horizontal shaper and write about its important parts.	7M
4.	a)	What are the different tool holding devices used in a drilling machine	7M
	b)	Explain principal parts of jig boring machine with neat sketches.	7M
5.	a)	Classify the milling machines. Explain any one	7M
	b)	What is Indexing? Explain different methods used in indexing.	7M
6.	a)	Sketch and explain tool and cutter grinder	7M
	b)	How the grinding wheel is selected? Outline various factors that influence its selection.	7M
7.	a)	Explain honing and lapping process with neat sketch.	7M
	b)	Describe various Broaching machines used in industry.	7M
8.	a)	Explain 3-2-1 principle of location	4M
	b)	Explain with neat sketch the common varieties of jigs used for hole – making Operations any four.	10M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G551

III B.Tech. I Semester Supplementary Examinations November 2019

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) Describe the processes of Rankine cycle. Derive the expression for its efficiency. 7M

   b) A simple Rankine cycle works between pressure of 30 bars and 0.04 bar. The initial condition of steam being dry saturated. Calculate the cycle efficiency. 7M

2. a) Sketch and describe a Cochran boiler. What are its special features? 7M

   b) Describe the working of an economiser with a neat sketch. 7M

3. The following readings were obtained during a boiler trial of 6 hours duration. Mean steam pressure=12 bar; mass of steam generated=40,000kg; mean dryness fraction = 0.85; mean feed water temperature=30°C; coal used=4000kg; calorific value of coal=33400kJ/kg.

   Calculate: (i) Factor of equivalent evaporation

   (ii) Equivalent evaporation from and at 100°C

   (iii) Efficiency of the boiler 14M

4. a) What is the function of nozzle & applications of nozzle? List out various types of nozzles. 6M

   b) Find the mass of flue gases flowing through the chimney when the draught produced is equal to 2 cm of water. Temperature of the flue gases is 297^0C and ambient temperature is 27^0C. The flue gases formed per kg of fuel burned are 20 kg. Diameter of the chimney is 2 m. Neglect the losses. 8M

5. a) Define the term 'compounding of steam turbine'. Explain any one compounding method. 6M

   b) Steam at 300 m/s is supplied to a single stage impulse turbine through a nozzle. The nozzle angle is 20^0, the mean diameter of the blade rotor is 100cm and it has a speed of 2000 r.p.m. Find suitable blade angles if there is no axial thrust. If the blade velocity coefficient is 0.9 and steam flow rate is 10kg/s, find the power developed. 8M

6. A reaction turbine has drum diameter of 2.15 m at a speed of 750 rpm with 14.5 kg/s of steam consumption. The height of the blade at a certain location is 0.16 m while the discharging angle is 25º. The pressure at this place is 4 bar and dryness fraction is 0.97. Estimate the power developed in the particular ring by assuming the turbine efficiency of 75%. Also find the heat drop while the steam passing over the pair of blades 14M

7. a) Give the differences between jet and surface condenser 7M

   b) What are the functions of condensers in a steam power plant? 7M

8. a) Explain throttle governing used for a steam engine. 6M

   b) A steam engine uses 500 kg of dry saturated steam/hr at a pressure of 20 bar and exhaust takes place at a pressure of 0.2 bar with dryness fraction of 0.78. Find Rankine efficiency and relative efficiency of the engine, if it develops 40 KW at full load. 8M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G554

III B.Tech. I Semester Supplementary Examinations November 2019

Desing of Machine Elements-I

(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) What are the various engineering properties of a material?
   b) What are the points to be considered in selecting an engineering material?
2. A vertical round rod 1.2 m long is struck by a weight of 600 N that falls on the top of it from a height of 30 mm. The Modulus of elasticity of the material is 2 x 10^5 MPa. Find suitable diameter of the rod if the maximum stress induced due to impact is to be limited to 150 MPa .
3. A flat plate of rectangular cross section 120 mm wide is subjected to a tensile load of 60MPa. For some reason a hole of 12 mm is to be drilled exactly at the center of the plate. Find the required thickness of the plate if the stress due to stress concentration is to be limited to 90 MPa.
4. Determine the diameter of rivet for a bracket loaded as shown in the figure Q 4b. The allowable stress for the rivets may be taken as 72 MPa.

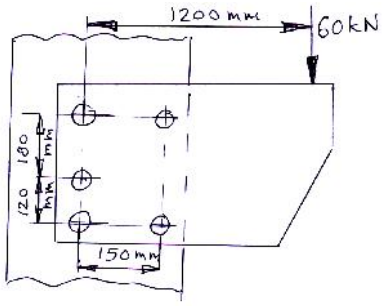

Fig. Q 4b

5. Determine the length of parallel fillet weld for a joint loaded as shown in figure Q 5a. The allowable tensile and shear stresses in the weld are 110 MPa and 70 MPa respectively. The size of the weld may be taken as 5 mm.

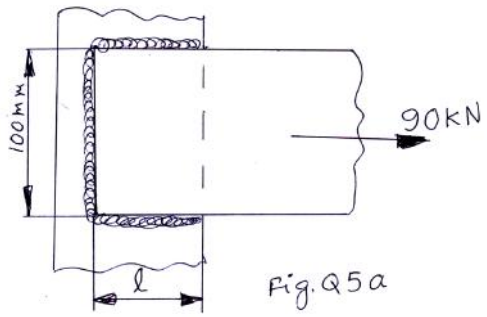

Fig. Q 5a

6. Design knuckle joint to two rounds rods and to support an tensile load of 60 kN. The allowable tensile stress=90MPa, Allowable shear stress=55MPa and allowable crushing stress = 125 MPa.
7. A solid steel shaft 1200 mm long is simply supported at its ends. It carries a central load of 1200 N. The shaft transmits 12 kW at 200 rpm. Find suitable diameter of the shaft taking allowable stresses in tension and shear as 100 MPa and 54 MPa.
8. Design a CI flange coupling to transmit 10 kW at 1500 rpm. The allowable shear stress for the CI flange is 4.5 MPa and the allowable stresses for the shaft, keys and bolts material are: 72 MPa in shear, 120 MPa in crushing.

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