Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Third Semester B.Tech Degree Examination December 2020 (2019 Scheme)

Course Code: IET201
Course Name: THEORY OF MACHINES AND DESIGN

Max. Marks: 100   Duration: 3 Hours

Approved Design Data hand book permitted
Assume missing data, if any suitably

PART A
Answer all questions. Each question carries 3 marks   Marks

1	Derive an expression for the ratio of belt tension?	(3)
2	With sketch, explain the inversions of a four bar chain?	(3)
3	With the help of sketch, differentiate between radial follower and offset follower?	(3)
4	Derive the equation for the height of a Watt governor in terms of speed?	(3)
5	Sketch and explain three common modes of failures of rivet?	(3)
6	Draw the sectional representation and symbol for the following welds? a) Fillet weld, b) square butt weld and c) single V butt.	(3)
7	State and prove law of gearing?	(3)
8	Derive the Lewis beam strength equation?	(3)
9	What are the various stresses experienced by a thick vessel, when it is acted upon by internal pressure?	(3)
10	What are the type of stresses experienced by a shaft under operation?	(3)

PART B
Answer any one full question from each module. Each question carries 14 marks

Module 1

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11	A four bar mechanism has the following dimensions. AB=40mm, BC=100mm, CD=80mm, AD= 60mm and angle DAB is 90^0. The link AD is fixed. The link AB revolves uniformly at 120 rpm, in clockwise direction. Find angular acceleration of link BC and CD?	(14)
12	A shaft running at 200 rpm drives another shaft at 400 rpm, and transmits 7.5 kW through open belt. The belt is 80mm wide and 10mm thick. The centre	(14)

distance is 4m. The smaller pulley is of 500 mm diameter, and the coefficient of friction between belt and pulley is 0.3. Calculate the stress in the belt?

Module 2

13 A cam of base circle radius 50 mm is to operate a roller follower of 20mm diameter. The follower is to have SHM. The follower axis has an offset of 15mm towards right. Draw the profile of the cam for a lift of 40mm. Angle of ascent $=60^0$, angle of dwell$=40^0$, and angle of descent $=90^0$, which is followed by dwell again? (14)

14 A porter governor has all four arms 300 mm long. The upper arms are pivoted on the axis of rotation and the lower arms are attached to the sleeve at a distance of 35 mm from the axis. The mass of each ball and sleeve are 7 kg and 54 kg respectively. If the extreme radii of rotation of the balls are 200 mm and 250 mm, determine the range of speed of the governor? (14)

Module 3

15 Design a double riveted butt joint with two cover plates for longitudinal seam of a boiler shell, 0.75 m diameter, to carry a maximum steam pressure of 1.05 N/mm^2. The allowable stresses are 35 N/mm^2 for tension, 28 N/mm^2 for shear and 52.5N/mm^2 for crushing. Efficiency of the joint is 75%. (14)

16 A rectangular steel plate is welded as a cantilever to a vertical column and supports a load 60 kN as shown. Determine the weld size if the allowable shear stress is not to exceed 140 MPa? All dimension in mm (14)
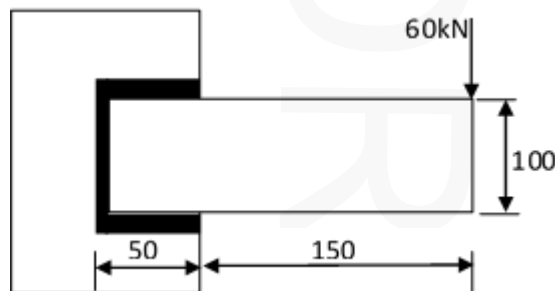
Module 4

17 A compressor running at 300 rpm is driven by 15 kW, 1200rpm motor through a set of 14.5^0, full depth gears. The motor pinion is to be C-30 forged steel and the driven gear is to be cast steel. Assuming medium shock condition determine the module, the face width, and the number teeth on each gear. Check the gears for dynamic load? (14)

18 Two helical gears are used in a speed reducer. The rated power of the speed (14)

reducer is 75 kW at a pinion speed of 1200 rpm. The speed ratio is 3 to 1. Assume medium shock and 24 hour operation. Material is cast steel for both the gears and the teeth are 20^0 full depth in normal plane. Determine the module, face width, and number of teeth? Also check for the wear.

Module 5

19 A machinery shaft is to transmit 61.5 kW at a speed of 1150 rpm with mild shock. The shaft is subjected to a maximum bending moment of 900 Nm and an axial thrust of 70 kN. The shaft is supported at intervals of 2.5 meters. Find out the diameter of the shaft? (14)

20 A thick cylinder of inner radius 100 mm and outer radius 200 mm is subjected to an internal pressure of 70 MPa and an external pressure of 10 MPa. Determine the hoop stress at the inner radius and outer radius? Determine also the maximum shear stress? Choose Poisson's ratio as 0.3 (14)

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