R18 Regulation *Subject code: 2P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, February 2024

Design of Machine Members -I

(Mechanical Engineering)

Maximum Marks: 70 Date:15.02.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A		
All the following questions carry equal marks	**(10x2M=20 Marks)**	CO	Bloom Tx
1	What are the steps In Machine Design Process?	1	L2
2	Explain about the stress concentration?	1	L2
3	Derive the Goodman's Equation?	2	L2
4	Discuss the about the Fatigue stress and Endurance Limits?	2	L3
5	Explain about the various type of joint and also in welding joints ?	3	L2
6	Explain the various types failures of Riveted Joints?	3	L2
7	Describe the various types of keys and advantages of the keys ?	4	L2
8	Explain about the woodruff key and Feathers key with neat sketch?	4	L2
9	List out the various types of couplings and its Functions of couplings?	5	L4
10	What is the function of transmission shaft?	5	L2
	Part-B		
Answer All the following questions.	**(5X10M=50Marks)**		
11	Explain the procedure for Engineering Design process. [10M]	1	L5
	OR		
12	A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment 30 kN-m. Determine the diameter of the shaft using two different theories of failure, and assuming a factor of safety of 2. Take E = 210 GPa and poisson's ratio = 0.25. [10M]	1	L5
13	Derive the Equation of Goodman's Equation for combination of stresses? [10M]	2	L3
	OR		
14	Determine the thickness of a 120 mm wide uniform plate for safe continuous operation if the plate is to be subjected to a tensile load that has a maximum value of 250 kN and a minimum value of 100 kN. The properties of the plate material are as follows: Endurance limit stress = 225 MPa, and Yield point stress = 300 MPa. The factor of safety based on yield point may be taken as 1.5. [10M]	2	L5

15	a)Two plates of 7 mm thick are connected by a triple riveted lap joint of zig-zag pattern. Calculate the rivet diameter, rivet pitch and distance between rows of rivets for the joint. Also state the mode of failure of the joint. The safe working stresses are as follows : Tensile stress= 90 MPa ; Shear stresses= 60 MPa ; and compressive stresses= 120 MPa. [10M]	3	L4
	OR		
16	Design the longitudinal joint for a 1.25 m diameter steam boiler to carry a steam pressure of 2.5 N/mm2. The ultimate strength of the boiler plate may be assumed as 420 MPa,crushing strength as 650 MPa and shear strength as 300 MPa. Take the joint efficiency as 80%. Sketch the joint with all the dimensions. Adopt the suitable factor of safety. [10M]	3	L5
17	Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically.Tensile stress = compressive stress = 50 MPa ; shear stress = 35 MPa and crushing stress= 90 MPa. [10M]	4	L5
	OR		
18	Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa. [10M]	4	L5
19	A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm.The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft; also indicate the ends where the bearings will be mounted? The pressure angle of the gear may be taken as 20°. [10M]	5	L5
	OR		
20	Design a cast iron protective type flange coupling to transmit 15 kW at 900r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used :Shear stress for shaft, bolt and key material=40 MPa Crushing stress for bolt and key=80 MPa Shear stress for cast iron=8 MPa. Draw a neat sketch of the coupling. [10M]	5	L5