CBCS SCHEME - Make-Up Exam

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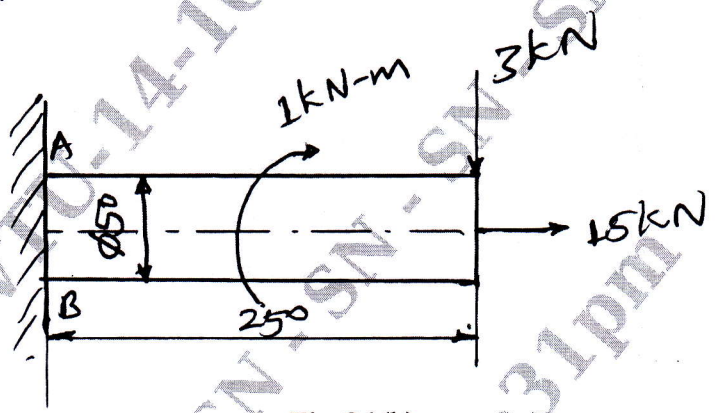
BAU503

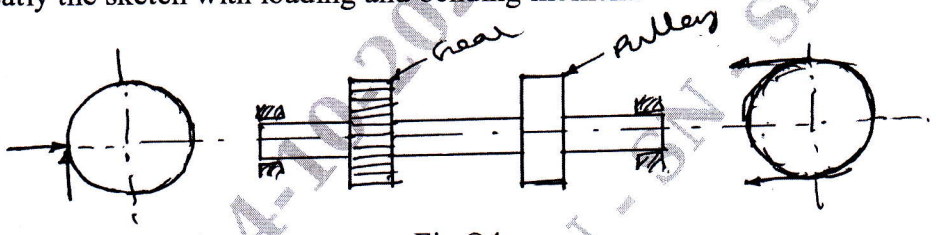
Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Design of Automobile Components

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Missing data, if any to be assumed suitably.

		Module – 1	M	L	C
Q.1	a.	List mechanical properties of engineering materials. Define any three.	06	L1	CO1
	b.	A circular rod of diameter 50 mm is subjected to loads as shown in Fig.Q1(b).  Fig.Q1(b)	14	L2	CO1
		OR			
Q.2	a.	Derive an expression for Soderberg criteria.	08	L3	CO1
	b.	The steel shaft having yield strength of 328.6 MPa is subjected to the following stresses. σ_x = 90 MPa, σ_y = 60 MPa and τ_{xy} = 30 MPa. Find the factor of safety according to the following theories of failure: (i) Rankine's Theory (ii) Guest's Theory	12	L2	CO1
		Module – 2			
Q.3	a.	Design knuckle joint for following specifications: Axial load = 80 KN, Ultimate stress = 450 MPa. Assume FOS = 4.5 and allowable crushing stress is 1.2 times the tensile stress.	14	L3	CO2
	b.	A square key is used to key a gear and a shaft of diameter 35 mm. The hub length of the gear is 60 mm, both key and shaft is made of same material having allowable stress of 55 MPa. What are the dimensions of the key according to maximum shear stress theory if 395 N-m of torque is to be transmitted?	06	L2	CO2

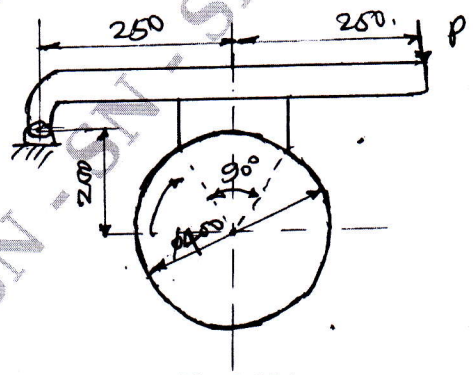
OR

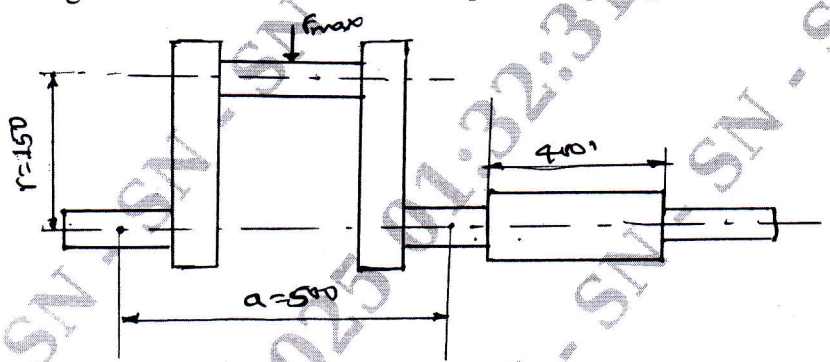
Q.4		A uniform circular carbon steel shaft made of SAE1025 annealed is mounted on two bearings 850 mm apart as shown in Fig.Q4. The shaft carries a gear A at 250 mm to the right of the left bearing and a pulley B at 250 mm to the left of the right bearing. The gear is subjected to horizontal force of 3500 N and a vertical upward force of 9600 N. The pulley is driven by a belt. With a tension on tight side to be 6000 N and on the slack side to be 2000 N. The shock and fatigue factors for bending and torsion as $K_m = 2$ and $K_t = 1.5$ respectively and weight of pulley to be 1500 N. Design the diameter of shaft for yield strength taking FOS as 3. Draw neatly the sketch with loading and bending moment.  Fig.Q4	**20**	**L3**	**CO2**

Module – 3

Q.5	**a.**	Derive an expression for stress and deflection for helical coil spring.	**10**	**L3**	**CO3**
	b.	A truck spring has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 KN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring.	**10**	**L2**	**CO3**

OR

Q.6	**a.**	Sketch and complete the expression for torque transmitted by a plate clutch for uniform pressure and uniform wear condition.	**10**	**L1**	**CO3**
	b.	Calculate the effort for a brake drum rotates at 150 rpm. The friction material permits a maximum pressure of 0.5 MPa and co-efficient of friction is 0.25, face width is 50 mm. If the brake is applied for 10 seconds at full capacity to bring shaft to stop. [Refer Fig.Q6(b)]  Fig.Q6(b)	**10**	**L2**	**CO3**

		Module – 4			
Q.7		Design a connecting rod for a petrol engine from the following data: Cylinder bore or diameter of piston = 100 mm Length of connecting rod = 350 mm Max. gas pressure or explosion pressure = 3 N/mm^2 Length of stroke = 150 mm Engine speed = 1500 rpm Weight of reciprocating parts = 25 N Compression ratio = 4:1 Assume any further data required for the design.	**20**	**L3**	**CO4**
		OR			
Q.8		Design a centre crankshaft for a single acting four stroke single cylinder engine to operate at 200 rpm. The particulars of the engine are as given below: Cylinder bore = 250 mm Max. gas pressure = 2.5 MPa, Length of stroke = 300 mm Ratio of length of connecting rod to crank radius = 4.5 Weight of flywheel cum belt pulley = 2 KN Total belt pull = 4 KN, Width of hub for flywheel cum belt pulley = 400 mm. The torque on the crank shaft is maximum when the crank turns through 25° from TDC and at this position the gas pressure inside the cylinder is 2 MPa. The belts are in the horizontal position. The crank shaft main bearing are 500 mm centre to centre. [Refer Fig.Q8]  Fig.Q8	**20**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Write a short note on battery pack development process.	**06**	**L1**	**CO5**
	b.	List and explain various stages of back pack design.	**07**	**L2**	**CO5**
	c.	List and explain major components of a battery pack.	**07**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the general procedure for mechanical design of battery pack.	**10**	**L2**	**CO5**
	b.	Explain the general procedure for thermal design of battery pack.	**10**	**L2**	**CO5**

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