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Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025

Design of Automobile Components

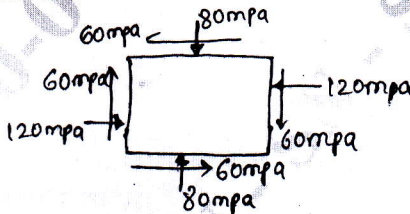
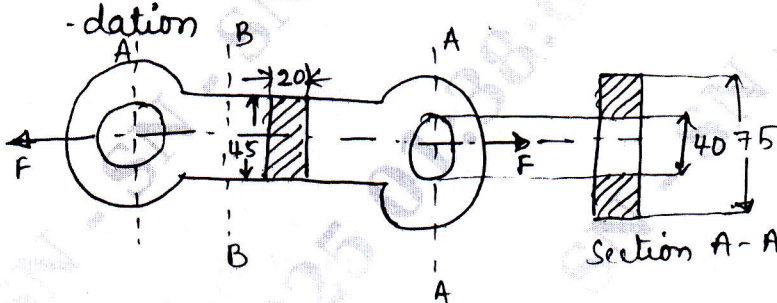
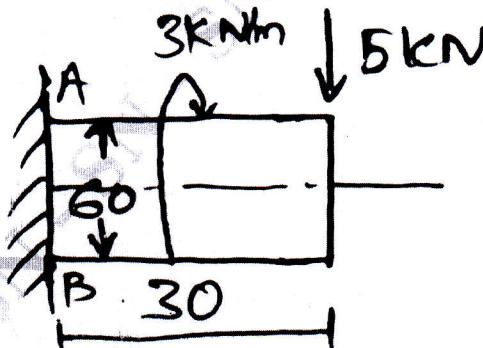
Time: 3 hrs.

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, may be suitably assumed.

Module – 1			M	L	C
Q.1	a.	The state of stress in a two dimensionally stressed body is shown in Fig.Q1(a). Determine : i) Determine principle stresses and their direction ii) Maximum shear stress.	10	L2	CO1
		 Fig.Q1(a)			
	b.	State maximum normal stress theory and the Fig.Q1(b) shows a CI link having a maximum normal stress of 65 MPa. Check the design to transmit a steady tensile load of 50 kN and comment on your recommendation.	10	L2	CO1
		 Fig.Q1(b)			
OR					
Q.2	a.	A circular rod of diameter 60 mm is subjected to bending and torsional load as shown in Fig.Q2(a). Determine the nature and magnitude of stresses at the critical point.	10	L2	CO2
		 Fig.Q2(a)			
	b.	Define S-N diagram. Briefly explain low cycle fatigue and high cycle fatigue.	10	L1	CO1

Module – 2

Q.3	a.	A 45 mm diameter shaft is made of steel with yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made up of steel with yield strength of 340 MPa is used. Find the required length of the key of the shaft is loaded to transmit the maximum permissible torque, use maximum shear stress theory and assume FOS is 2.	10	L3	CO2
	b.	Design a cast iron protective type of flange coupling to transmit 15 MW at 900 RPM from an electric motor, the service factor may be assumed as 1.35, the following permissible used as shear stress of the shaft, bolt and key material is 40 MPa and crushing stress of bolt and key is 80 MPa.	10	L2	CO2

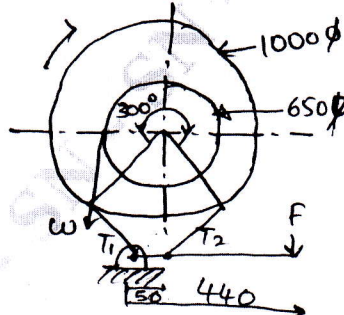
OR

Q.4		A steel solid shaft transmitting 15 KW at 200 rpm supporting on two bearings 750 mm apart and has two gears keyed to it. The pinion having 30 teeth of 5 mm module is located 100 mm apart to left of the right hand bearing and deliver power horizontally to the right. The gear having 100 teeth of 5 mm module is located 150 mm to the right of left hand bearing and receives power in vertical direction from below using allowable stress of 54 MPa in shear. Determine the diameter of the shaft.	20	L3	CO2
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Module – 3

Q.5	a.	Derive an equation for stress and deflection in a helical coil spring of circular cross section.	10	L2	CO2
	b.	A multiplate clutch of alternate bronze and steel plate is to transmit 6 KW at 800 rpm. The inner radius is 38 mm and outer radius is 70 mm. The coefficient of friction is 0.1 and maximum allowable stress is 350 kN/m ² determine : i) Axial force transmitted ii) Total number of discs iii) Average pressure iv) Actual maximum pressure.	10	L3	CO3

OR

Q.6	a.	In a simple band brake the length of lever is 440 mm. The tight end of the band is attached to the fulcrum of the lever and slack end to a pin 50 mm from fulcrum. The diameter of the brake drum is 1 m and the arc of the contact is 300°, the co-efficient of friction between the band and the drum is 0.35. The brake drum is attached to hoisting drum diameter 0.65 m that sustain a load of 20 kN. Determine : i) Force required at the end of lever to just support load ii) Required force when the direction of rotation reversed iii) Width of steel band if tensile stress limited to 50 mm. 	10	L3	CO3
	b.	A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm, if the permissible shear stress is 350 MPa modulus of rigidity is 84 kN/mm ² . Find the axial load which spring can carry and deflection per active turn.	10	L2	CO3

Module – 4

Q.7	a.	Sketch and explain the different types of crank shaft.	8	L2	CO3
	b.	Determine the dimensions of cross section of connecting rod for a diesel engine with following data cylinder bore 100 mm, length of connecting rod 350 mm maximum gas pressure 4 MPa and factor of safety 6.	12	L3	CO4

OR

Q.8	a.	Define bearing. Explain the classification of bearing.	10	L2	CO3
	b.	The following data is given for a connecting rod engine speed 1800 rpm, length of connecting rod 350 mm, length of stroke 175 mm, density of material 7800 kg/m ³ . Thickness of web flanges 8 mm calculate the whipping stress in connecting rod.	10	L3	CO4

Module – 5

Q.9	a.	What are the major components of battery pack?	10	L2	CO5
	b.	Write the types of cell and hierarchy of battery pack.	10	L2	CO2

OR

Q.10	a.	Explain electrical design of battery pack.	10	L2	CO5
	b.	Factors considers when selecting a thermal management system in battery pack.	10	L2	CO5
