Hall Ticket Number:

1	6	0	2	1	8	7	3	6	1	1	1

Code No. : 16543 AS

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A+-- Grade

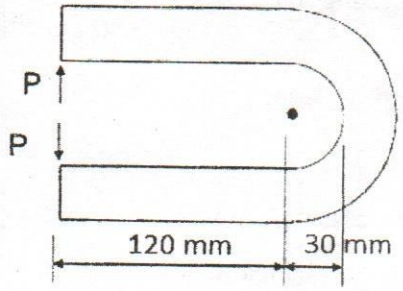
B.E. (Mech. Engg.) VI-Semester Advanced Supplementary Examinations, July-2023

Machine Design

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Distinguish between straight and curved beams.	2	2	1	2
2.	Define a curved beam and mention it's applications.	2	1	1	3
3.	Classify the mechanical springs by mentioning their applications.	2	2	2	1
4.	What is spring surge? How to eliminate it?	2	1	2	1
5.	List the types of standard gear teeth systems.	2	1	3	2
6.	List the materials and applications of worm gears.	2	1	3	1
7.	What is bearing modulus and mention its significance.	2	1	4	2
8.	Define rating life of rolling contact bearings.	2	1	4	1
9.	Define and mention the importance of skirt of the Piston.	2	1	5	2
10.	List the cross sectional shapes of shank of connecting rod and mention the preferable with reasons.	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	What is the preferable cross section used for Crane hook and mention the reasons.	3	3	1	2
b)	For a round cross-section of diameter 60 mm, of C clamp shown in figure, find the maximum tensile and compressive stress if P 10 kN. 	5	2	1	3
12. a)	Derive the formula for load-deflection in a helical compression spring.	3	2	2	3
b)	A direct reading tension spring balance consists of a helical tension spring that is attached to a rigid support at one end and carries masses at the other free end. The pointer attached to the free end moves on a scale and indicates the mass. The length of the scale is 100 mm that is divided into 50 equal divisions. Each division of the scale indicates 0.5 Kg. The maximum capacity of the spring is balance is 25 kg. The spring index is 6. The spring made of an oil hardened and tempered steel wire of Grade SW (σ_u= 600 N/mm^2 and G =81370 N/mm^2). The permissible shear stress in the spring wire is recommended as 50% of the ultimate tensile strength. Design the spring and give its specifications.	5	2	2	4

Contd... 2

13.	A 15 kW and 1200 rpm motor drives a compressor at 300 rpm through a pair of spur gears having 20° stub teeth. The center-to-center distance between the shafts is 400 mm. The motor pinion is made of forged steel having allowable static stress of 210 MPa, while the gear is made of cast steel having allowable static stress of 140 MPa. Assuming that the drive operates 8 to 10 hours per day under light shock conditions, find from the standpoint of strength, 1. Module; 2. Face width and 3. The number of teeth and pitch circle diameter of each gear. Check the gears thus designed from the consideration of wear. The surface endurance limit may be taken as 700 MPa.	8	3	3	3
14. a)	What are the various terms used in journal bearings analysis and design?	3	3	4	1
b)	A ball bearing subjected to a radial load of 4200 N is expected to have a satisfactory life of 10 000 hours at 900 rpm with a reliability of 95%. Calculate the dynamic load carrying capacity of the bearing, so that it can be selected from the manufacturer's catalog based on 90% reliability. If there are four such bearings each with a reliability of 96% in a system, what is the reliability of the complete system?	5	2	4	3
15.	The following particulars refer to a four-stroke diesel engine: Cylinder bore = 150 mm; Stroke = 187.5 mm; R.P.M. = 1200; Maximum gas pressure = 5.6 N/mm^2; Mass of reciprocating parts = 1.75 kg. Determine: a. The dimensions of an I-section connecting rod of forged steel with an elastic limit compressive stress of 350 MPa. The ratio of the length of connecting rod to the radius of the crank is 4 and the factor of safety may be taken as 5. b. The wrist pin and crankpin dimensions on the basis of bearing pressures of 10 N/mm^2 and 6.5 N/mm^2 of the projected area respectively. c. The dimensions of the small and big ends of the connecting rods, including the size of the securing bolts of the crankpin end. Assume that the allowable stress in the bolts is not to exceed 35 N/mm^2. Draw dimensioned sketch of the connecting rod.	8	4	5	4
16. a)	Discuss the design procedure of a crane hook.	4	2	1	2
b)	Discuss the design of a concentric springs.	4	4	2	1
17.	Answer any ***two*** of the following:				
a)	List the gear teeth failures with the preventive measures.	4	3	3	1
b)	Discuss the design of rolling contact bearings for cyclic loads.	4	2	4	2
c)	Discuss the design procedure of IC engine piston.	4	3	5	2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	37.5%
iii)	Blooms Taxonomy Level – 3 & 4	42.5%

*****