Total No. of Questions – [06] Total No. of Printed Pages: 3

G.R. No.	

DECEMBER 2021 - ENDSEM EXAM

T. Y. B. TECH. (Mechanical) (SEMESTER - I)

COURSE NAME: Design of Machine Element-II

COURSE CODE: MEUA31184

(PATTERN 2018)

Time: [**1&1/2 Hour**] [Max. Marks: **30**]

(*) Instructions to candidates:

1) **Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6.**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data or Table where ever required**

Q.1 a Simplify the Stribeck's equation for rolling contact bearing. [4 Marks]

b A single-row deep groove ball bearing is subjected to a radial force of 8 kn and a thrust force of 3 kn. The shaft rotates at 1200 rpm. The expected life L_{10h} of the bearing is 25000.The minimum acceptable diameter of shaft is 75 mm. select a suitable ball bearing for this application. [6 Marks]

d	C	Co	Designation
75	66300	40500	6215
	112000	72000	6315
	153000	114000	6415

OR

Q2 a Illustrate the bearing selection Procedure for Rolling contact bearing from manufacturer's catalogue. [4 Marks]

b A Single row deep groove ball bearing is subjected to 20 second work cycle that consists of following two parts. The static and dynamic capacities of ball bearing are 50 and 60 kn respectively. Evaluate the expected life of bearing in hours. [6 Marks]

	Part I	Part II
Speed (rpm)	720	1440
Axial load(kn)	12.5	6.25
Radial load(kn)	45	15
Duration(s)	10	10

$\left(\frac{F_a}{C_0}\right)$	$\left(\frac{F_a}{F_r}\right) \le e$		$\left(\frac{F_a}{F_r}\right) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

Q.3 a Derive the Petroff's Equation. [4 Marks]

b The following data is given for a hydrostatic bearing. [6 Marks]
Thrust load =500 kn , Shaft speed =720 rpm, shaft diameter =500,recess diameter =300 , film thickness =0.15mm , viscosity of lubricant= 160 sus, specific gravity=0.86
Calculate
i)Supply Pressure ii) flow requirement in liters/min ,iii) power loss in pumping iv) Frictional power loss.

OR

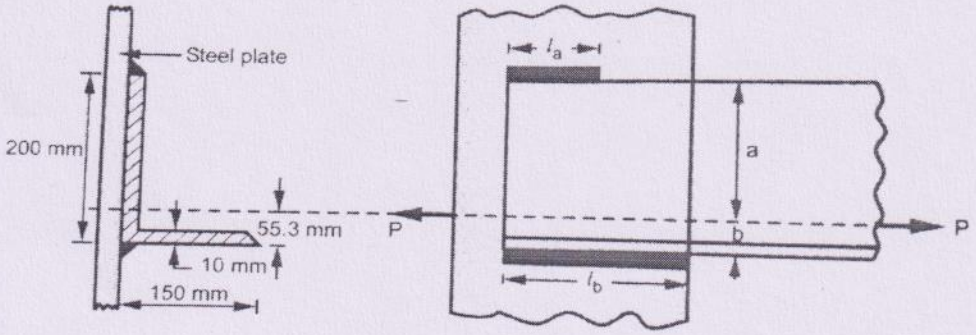
Q.4 a Interpret bearing characteristic number as applied to journal bearing and its significance. [4 Marks]

b The following data is given for a 360° hydrodynamic bearing: [6 Marks]
Journal Diameter $50^{-0.080}_{-0.119}$, Bearing Diameter $50^{+0.039}_{+0.000}$
Bearing length =50 mm , Journal Speed = 1500 rpm, Radial load = 5 kn. The bearing is machined on a lathe from bronze casting, while the steel journal is hardened and ground. The surface roughness (c/a) values for turning and grinding are 3.2 and 0.8 microns respectively. For thick-film hydrodynamic lubrication, the minimum film thickness should be six times the sum of surface roughness values for the journal and bearing. Evaluate the quality and quantity of the lubricant required. Refer Table for bearing data.

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max.}}\right)$
1	0	1.0	∞	(85)	∞	π	0	–
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0

Q.5 a Derive the method of determining the size of bolt when the bracket carries eccentric load perpendicular to the axis of the bolt. [4 Marks]

Q.5 b A 200x150x10 mm angle is to be welded to a steel plate by fillet welds as shown in fig. if the angle is subjected to a static load of 200 Kn. Find the length of weld at the top and bottom. The allowable shear stress for static loading may be taken as 75Mpa. [6 Marks]



OR

Q.6 a Derive the procedure in the design of bolts for eccentrically loaded bolted joints in shear. [4 Marks]

Q.6 b A welded connection, as shown inFig.is subjected to an eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100 N/mm2. Assume static conditions. [6 Marks]