*Knowledge Resource & Relay Centre (KRRC)*

AIKTC/KRRC/SoET/ACKN/QUES/2017-18/     Date: _____

School: __SoET-CBSGS__    Branch: __MECH. ENGG.__   SEM: _____VII_____

To,
**Exam Controller,**
**AIKTC, New Panvel.**

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question

papers from your exam cell:

| Sr. No. | Subject Name | Subject Code | Format SC | Format HC | No. of Copies |
|---|---|---|---|---|---|
| 1 | Machine Design -II | MEC701 | | ✓ | |
| 2 | CAD/CAM/CAE | MEC702 | | ✓ | |
| 3 | Mechanical Utility Systems | MEC703 | | ✓ | |
| 4 | Production Planning and Control | MEC704 | | ✓ | |
| 5 | Elective- I    PPE | MEE701X | | ✓ | |
| 6 | | | | | |
| | | | | | |
| | | | | | |

**Note: SC – Softcopy, HC - Hardcopy**

(Shaheen Ansari)
**Librarian, AIKTC**

Q. P. Code: 25205

**(3 Hours)**

**N.B.** 1) **Question No. 1 is compulsory**
2) Solve **Any Three** from remaining **Five** questions.
3) Use of standard data book is permitted
4) Assume suitable data if necessary, giving justification

Q1   Answer any **Four** from the following
a)   Explain how assumptions made in Lewis equation are taken in to account during design?   5

b)   Explain how the following factors influence the life of a bearing
(a) Load (b) Speed (c) Temperature   5

c)   Briefly explain chain drives?   5
d)   Why it is necessary to dissipate the heat generated when clutches operate?   5
e)   Define the following terms used in worm gearing with neat sketch.
(a) Lead (b) Lead angle (c) Normal pitch (d) Helix angle.   5

Q2   Design a Two-stage spur gear reduction unit with 20° F.D invoulte teeth. The input   20
shaft is connected to 9.5 KW, 1400 rpm motor through a flexible coupling. The output
shaft speed shall be approximately 200 rpm. The gears are made up of plain carbon
steel.
   i)   Find dynamic load and check for wear load.
   ii)   Decide the constructional details of the gear and pinion showing neat
sketch.

Q3 a)   Design a hydrodynamic bearing for a centrifugal pump to support a load of 8 KN when   12
operating at 1600 rpm. Write assumptions if required and analyze the performance.

Q3 b)   A multiple disc clutch, steel on bronze, is to transmit 8 KW at 800 r.p.m. The   08
inner radius of the contact is 40 mm and outer radius of the contact is 70 mm. The
clutch operates in oil with an expected coefficient of 0.1. The average allowable
pressure is 0.5 N/mm$^2$.Use uniform wear theory.
1.The total number of steel and bronze discs
2. The actual axial force required.
3. The actual average pressure.
4. The actual maximum pressure.

Q4   A rotary disc cam and central translator follower has following motion:-   20
Forward stroke = 20 mm in 100° rotation of cam with SHM, dwell to complete the
cycle.
Return stroke = 20 mm with SHM in 100° of cam rotation remaining dwell to complete.
Mass of follower is 1 Kg and cam shaft rotates at 500 rpm and maximum pressure
angle is 25° during forward stoke. The external force is 310N during forward stroke
and 55 N during return stroke. Determine
  1. Base circle radius
  2. Design the cam
  3. Design the spring
  4. Calculate maximum cam shaft torque.

Q5   A pair of bevel gear is required to transmit 8 KW power from a pinion shaft rotating   20
at 400 rpm with reduction ratio 3.5. The shaft angle is 90° and drive is subjected to
moderate shock and operates at 12 hrs/day. Design stresses for pinion are 380 MPa
and 1100 MPa. Design and check pair in strength and wear and also perform arm
design.

Q6 a)   A V- Belt drive is to transmit 15 KW to a compressor. The motor speed is 1100 rpm   12
and compressor pulley runs at 400 rpm. The coefficient of friction between the belt
and pulley is 0.25. The compressor operates for 10-12 hrs/ day. Design the drive for
above application. Design should include following
  1. Section of V-Belt material
  2. Exact centre distance
  3. Belt size
  4. Number of belts
  5. Life of belt.

Q6 b)   An angular contact ball bearing is used for gear shaft to support a radial load of 9 KN   08
and 6 KN along the axial direction. The shaft rotates at 50 rpm. Select suitable size of
bearing, if it is required to have a life of 30000 hrs with a probability of survival of
93 %. Check selected bearing is safe for given application.

*************

Q. P. Code: 39285

**(Time: 3 Hours)**                                    Max. Marks: 80

Note:

    **1. Question 1 is Compulsory**
    2. Solve any three from remaining five
    3. Figures to right indicate full marks
    4. Assume suitable data if necessary

Q.1      a) Compare Beizer and B-Spline curve      5

         b) Describe an algorithm for the removal of hidden lines.      5

         c) Describe the axis representation system used for CNC Milling      5
             machines. Discuss the various interpolation methods used in NC
             machines.

         d) Explain the Socio-techno-economic aspects of CIM      5

Q.2      a) Find the midpoint of the Bezier curve having end points $P_0$ (0,0)      10
             and $P_3$(7,0). The other control points are $P_1$(7, 0) and $P_2$(7, 6).

         b) Explain industrial Robots and its application in manufacturing.      10

Q.3      a) Write a manual part program to machine the contour as shown in      10
             figure. The component is 12mm thick.
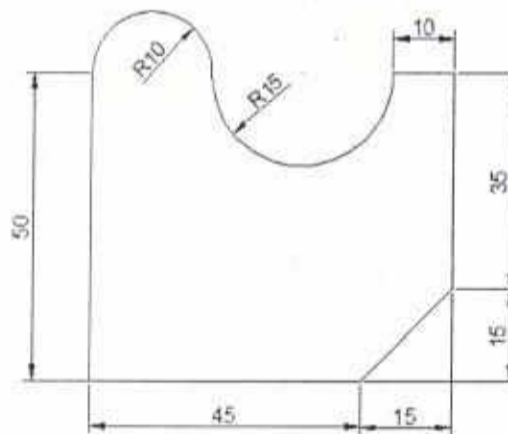


         b) Explain laminated object manufacturing with its advantages and      10
             disadvantages.

Q.4    a) Show that the transformation matrix for a reflection about the line            8
         $y = x$ is equivalent to a reflection relative to the x-axis, followed by
         an anticlockwise rotation of 90°.

       b) Explain the APT statements: i) GOTO and GO/TO ii) GODLTA            6
         and GOBACK and iii) INTOL and OUTTOL.

       c) Explain any one velocity feedback device.            6

Q.5    a) Write a part program for the component shown in the figure assuming            10
         the raw billet size of dia. 60 mm and length 80 mm using canned
         cycle for rough turning followed by finished turning, keeping the
         finishing allowance as 0.5 mm and 0.3 mm along Z and X axis
         respectively.
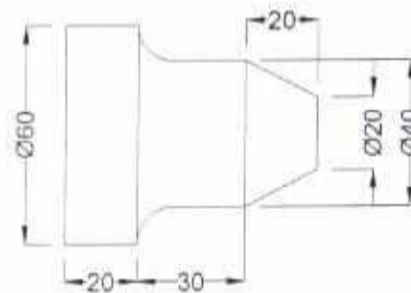


       b) Plot a hermite cubic curve having endpoints $P_0(1,1)$ and $P_1(7,4)$. The            10
         tangent vector for end $P_0$ is defined by a line joining $P_0$ and another
         point $P_2(8,7)$, whereas the tangent vector for end $P_1$ is defined by a
         line joining $P_1$ and the same point $P_2(8,7)$.

Q.6    Write short note on any **Four**:            20
         a) Macros and Subroutines
         b) Data structures for interactive modeling
         c) Steps involved in CAE
         d) Photolithography
         e) Database requirements in CIM

2F4A7267688055B483146CAF0555FE67

**University of Mumbai**

Correction in Program Code - T3927 B.E.(AUTOMOBILE)(SEM VII) (CBSGS) / T1272 / CAD/CAM/CAE and T5327 - B.E.(MECHANICAL)(SEM VII) (REV-2012) (CBSGS) / T1272 - CAD/CAM/CAE and T2227 / B.E (Mechatronics)(SEM-VII))(CBSGS)(R2012) / T1272 / CAD/CAM/CAE  Q.P Code : 39285

Read as

Q 2 a)
The other control points are **P1(0,7)** and **P2(7,6)**

Instead of

The other control points are P1(7,0) and P2(7,6)

University of Mumbai
https://muapps.in
support@muapps.in
022-26534263 / 022-26534266
Mon-Fri, 10am - 5pm

Reply, Reply all or Forward

**Time duration: 3 Hours**        Marks   80

Note: 1) Question no. 1 is compulsory

     2) Attempt any **three** questions out of the remaining **five** questions

     3) Clearly mention the assumptions made if any

Q.1 Solve any four                                                  20

a) Explain with neat labeled diagram vortex casing in case of centrifugal pump.

b) Explain Ideal Indicator diagram in detail.

c) Define following terms for centrifugal compressor.

     1) Degree of reaction

     2) Slip factor

     3) Work factor

     4) Pressure coefficient

d) A single-cylinder, double-acting, reciprocating air compressor receives air at 1 bar; 17°C, compresses it to 6 bar according to the law $pV^{1.25}$ = constant. The cylinder diameter is 300mm. The average piston speed is 150 m/min at 100 rpm. Calculate the power required in kW for driving the compressor. Neglect clearance.

e) Write a note on load unload test.

Q.2 a) What are axial thrust in centrifugal pumps? Discuss the methods of balancing the axial thrust     10

b) In an axial flow compressor, having 10 stages works with 50% degree of reaction. It compresses   10 air with a pressure ratio of 5. The inlet conditions of air are 27°C and 100 kpa. The air enters the compressor with a velocity of 110 m/s. The mean speed of the rotor blade is 220 m/s. The isentropic efficiency is 85%. Calculate work input per kg and blade angle.

Q.3 a) A single-stage centrifugal pump with impeller diameter of 30 cm rotates at 2000 rpm and lifts 3 m³   8 of water per second to a height of 30 m with an efficiency of 75%. Find the number of stages and diameter of each impeller of a similar multistage pump to lift 5 m³ of water per second to a height of 200 m when rotating at 1500 rpm.

b) A double-acting reciprocating pump, running at 40 rpm, is discharging 1 m³ of water per minute.   6 The pump has a stroke of 400 mm. The diameter of piston is 200 mm. The delivery and suction head are 20 m and 5 m respectively. Find the slip of the pump and power required to drive the pump.

**[TURN OVER**

c) Explain methods of improving efficiency in pumping system.　　　　6

Q.4 a) Explain construction and working of double-acting reciprocating pump with neat labeled diagram,　　10
and derive the formula for discharge and work done to drive a double-acting pump.

b) Calculate the power required to compress 25 m³/min atmospheric air at 101.3 kpa, 20°C to a　　10
pressure ratio of 7 in an LP cylinder. Air is then cooled at constant pressure to 25 C in an intercooler
before entering HP cylinder, where air is again compressed to a pressure ratio of 6. Assume polytropic
compression with n= 1.3 and R = 0.287 kJ/kg K.

Q.5 a) Explain in detail construction and working of axial compressor with neat labeled diagram, and　　10
state losses in axial compressor.

b) The outer diameter of an impeller of a centrifugal pump is 400 mm and outlet width is 50mm. The　　10
pump is running at 800 rpm. and is working against a total head of 15 m. The vanes angle at outlet is
40° and manometric efficiency is 75%. Determine

(i) velocity of flow at outlet　　　　(ii) velocity of water leaving the vane

(iii) angle made by the absolute velocity at outlet with the direction of motion at outlet.

(iv) discharge

Q.6 Write short note on following (any four)　　20

a) Limitations of single stage reciprocating compressor

b) Model testing of centrifugal pump

c) Screw pump

d) Variable Speed Drive

e) Applications of compressed air in industry

-------------------------------

**Q.P. Code: 27218**

(Three Hours)                                                    **Total Marks: 80**

Instructions:
- Q. 1 is compulsory.
- Attempt any **THREE** questions from the remaining questions
- Assume suitable data wherever necessary
- Figures to the right indicate full marks.

Q1  Answer any four                                                                    20
    a)  Functions of PPC
    b)  Work orders
    c)  JIT and MRP
    d)  Computer aided process planning
    e)  Forecasting Error and Forecasting Bias
    f)  Factors influencing scheduling

Q2  A)  Explain in details the pre-requisites of the PPC in the form of various types of data.    10

    B)  Annual requirement of an item is 2400 units. Each item costs the company Rs. 6/unit. The    10
        manufacturer offers discount of 5% if 500 or more quantities are purchased. The ordering
        cost is Rs 32 /order and inventory cost is 16%. Whether it is advisable to accept the discount?
        Comment.

Q3  A)  For the given demand pattern, Estimate the sales forecast for the year 2018, using    10
        exponential smoothing forecaster. Take $\alpha$=0.5 and the forecast for the year 2013 as 180
        units. Compare the forecast with least square method.

| Year   | 2013 | 2014 | 2015 | 2016 | 2017 |
|--------|------|------|------|------|------|
| Demand | 200  | 188  | 179  | 190  | 208  |

    B)  What do you understand by                                                    10
       i.   Safety Stock
       ii.  Instantaneous Stock replenishment
       iii. Reorder Level
       iv. Lead Time
       v.  Economic Order Quantity

Q4  A)  Explain the linkage of Product Planning with Process Planning and describe the various    10
    steps involved in making a process plan.

**Turn Over**

B) Four different jobs can be made on four different machines. The set up and take down costs    10
are assumed to be prohibitively high for changeovers. The matrix below gives the cost in
rupees of producing Job *I* on Machine *J*.

|       |    | MACHINES |    |    |    |
|-------|----|------|------|------|------|
|       |    | M1 | M2 | M3 | M4 |
|       | J1 | 5  | 7  | 11 | 6  |
| JOBS  | J2 | 8  | 5  | 9  | 6  |
|       | J3 | 4  | 7  | 10 | 7  |
|       | J4 | 10 | 4  | 8  | 3  |

How should the jobs be assigned to the various machines so that the total cost is minimized?

Q5  A) Construct the network for the following activities. The three time estimates for activities are    10
given; calculate the Estimated Time for the activities. Determine the critical path. What is
the probability that the project will completed in 20 days?

| Activities | To  | Tm  | Tp  |
|------------|-----|-----|-----|
| 1-2        | 2   | 2   | 8   |
| 2-3        | 1   | 1.5 | 11  |
| 2-4        | 0.5 | 1   | 7.5 |
| 3-4        | 0   | 0   | 0   |
| 3-5        | 1   | 2.5 | 7   |
| 4-5        | 6   | 7   | 8   |
| 3-6        | 1   | 2   | 3   |
| 4-6        | 3   | 4   | 11  |
| 5-6        | 4   | 6   | 8   |

B) Explain the following    10
    i.   Difference between PERT and CPM.
    ii.  Types of Floats and their calculations.

Q6  A) What are the principle functions of Dispatching? What are the documents generally    10
prepared while performing Dispatching function?

B) The utility data for a network is given below. Crash the network to minimum project    10
duration and determine the project cost for that duration.

| Activity | Normal | | Crash | |
|----------|--------------------|------------|--------------------|------------|
|          | Duration (weeks) | Cost (Rs) | Duration (weeks) | Cost (Rs) |
| 0-1      | 1  | 5000  | 1 | 5000  |
| 1-2      | 3  | 5000  | 2 | 12000 |
| 1-3      | 7  | 11000 | 4 | 17000 |
| 2-3      | 5  | 10000 | 3 | 12000 |
| 2-4      | 8  | 8500  | 6 | 12500 |
| 3-4      | 4  | 8500  | 2 | 16500 |
| 4-5      | 1  | 5000  | 1 | 5000  |

BE-Sem-VII-Mech-CBSGS-PPE          4/6/18

Q. P. Code: 50502

**(3 hours)**

**Total Marks : 80**

N.B. : 1) Question No. 1 is compulsory.
2) Attempt any three questions from remaining Five.
3) Assume suitable Data wherever necessary.
4) Justify your answers with diagrams and graphs.

| | | |
|---|---|---|
| Q.1 | Write short notes on **any four:-**<br>   i) Mechanical Dust collector.<br>   ii) Run-off river plant<br>   iii) Different types of Tariff methods.<br>   iv) Classification of nuclear power plants.<br>   v) Advantages of Gas power plant over other power plants. | 20 |

Q.2 (a)  Explain CANDU type nuclear reactor with neat sketch mentioning type of    10
fuel, moderator used. Give advantages and disadvantages.

Q.2 (b)  The incremental fuel costs for two generating units A and B of a power plant   10
are given as:
$$dF_A / dP_A = 0.065P_A + 25$$
$$dF_B / dP_B = 0.08P_B + 20$$
Where F is fuel cost in rupees per hour and P is power output in MW.
Find: i) The economic loading of two units when the total load supplied by
the power plant is 160 MW.
    ii) The loss in fuel cost per hr if the load is equally shared by both
units.

Q.3(a)  Explain BWR. How does it differ from PWR?    10

Q.3(b)  What are the advantages of a pumped storage hydro-power plant ? Draw a   10
neat sketch and explain.

Q.4 (a)  From the following data, estimate the generating cost of the power delivered   10
by the station and find the reserve capacity available.

| | | |
|---|---|---|
| Installed capacity of the plant: | = | 142.5Mw |
| Annual Load factor: | = | 60% |
| Capacity factor: | = | 50% |
| Capital cost of the plant: | = | Rs. 130 x 10$^6$ |
| Annual cost of coal, oil,tax and salary: | = | Rs. 18.8 x10$^6$ |
| Rate of Interest and Depreciation each: | = | 5 % of Capital |
| Units of energy used to run plant auxiliary: | = | 6% of total units |
| supplied. | | |

Q.4 (b)  Define the following:    10
i) Load factor, ii) Diversity factor, iii) Plant capacity factor iv) Plant use
factor and v) demand factor .

| Q.5 (a) | With neat sketch explain combined cycle power generation with merits and demerits. | 10 |
| Q.5 (b) | Explain Sodium Graphite Reactor with it's advantages and disadvantages. | 10 |
| Q.6 | Write short notes on **any four** of the following: | 20 |

     i) Surge Tank
     ii) Rainfall measurements
     iii) Parameters affecting Thermodynamic efficiency of combined cycle
     iv) Pneumatic ash handling system
     v) Classification of power plants.

**********